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SEPTEMBER, 1836.

Practical and Theoretical Mechanics.

On the manufacture of Military Projectiles, translated from the French of F. I. Culmann, Chef d'escadron d'artillerie, &c. &c. By ALFRED MORDECAI, *Captain United States Ordnance Department.*

(CONTINUED FROM p. 90.)

Of Rolling Shot.

Shot are rolled in a cast-iron barrel closed at the ends, having an elliptical door, and fixed on an iron axis which communicates with the shaft of a wheel from which it receives motion.

There are no fixed dimensions for such a barrel; one three feet long, twenty-two or twenty-four inches in diameter, will serve to roll as many shot as can be hammered under one hammer. The barrel should be very strong, eighteen or twenty lines thick and hooped with iron. It should be half filled; if it were less full, the shot would be less quickly polished, as we might suppose by considering the pressure which they exert on one another. This barrel ought to make about twenty or thirty turns in a minute: if the velocity were too great the shot would acquire a centrifugal force, which, pressing them against the sides of the barrel, would prevent them from acting on each other: on the other hand if the motion were too slow, or if the cask were too full, the shot would not strike with sufficient force.

When the shot are not of white metal, which, on account of its hardness, is acted on with difficulty, the charge may be renewed every two or three hours.

Rolling polishes the surface of the shot and exposes slight flaws; but it cannot correct a defect of sphericity, nor can it remove the marks of the seam and the gate. We are far from thinking that it can be substituted for hammering, which ought necessarily to follow it. Shot which have been first rolled may be hammered more quickly and at a lower heat, and receive a much finer surface. The small expense therefore which it occasions, is compensated in hammering, by a saving of fuel and labor: of undoubted advantage to the service of the artillery, its adoption will not increase the expenses of the founder.

Even if the shot were perfectly spherical when they come out of the polishing barrel, it would be better to have them hammered, because the hammer subjects them to a certain proof, very imperfect it is true, and because rolled shot are liable to oxidation, whilst those which have been hammered are covered by a slight coat of oxide, which generally protects iron and preserves it from further oxidation.

Of Hammering Shot.

The object of hammering is to make the shot more spherical and its surface more even, by removing all the little irregularities, the mark of the gate and that of the seam. The operation is performed on the heated shot, under a hammer weighing from sixty to seventy kil, (130 to 150 lbs.) the face of which is a spherical cup of the depth of eight or nine lines.

The shot are heated in a reverberatory furnace of a particular construction. The floor, which is inclined, is from fifteen to eighteen feet long, and eighteen inches wide. The height of the arch is fourteen inches. The shot introduced at one end of the furnace, descend by the inclination of the floor, and reach the point where the heat is greatest; when they have acquired the requisite degree of heat they are taken away by the workmen, whilst other shot descend into their places. By such an arrangement the work is facilitated and the shot are left the least possible time exposed to the greatest heat, which prevents too great an oxidation. The scales of oxide fall off under the hammer, and leave on the shot marks of a depth proportionate to the thickness of the scale.

At Hayange, wood is used for heating the shot; at other places coal has been successfully employed. The degree of heat ought to depend both on the nature of the metal, and on the degree of imperfection in the form of the shot. If it is nearly spherical, especially if it has been first rolled, and if the metal is good, of a clear grey, it may be heated very low, to a brownish red only, and the shot will be the better. In general, cast, like wrought iron, when worked under the hammer or between rollers, at a very low temperature, has a finer appearance than if the temperature had been higher. But if the shot be not spherical, or if it be of white metal, it is necessary to heat it very much, and to suffer the disadvantages which result from it. A great many of these shot then break under the hammer and the others are always defective. This never fails to occur when they are cast with white metal.

They are generally heated at Hayange, only to cherry red. A workman draws the shot with a hook to the mouth of the furnace, another seizes it with the tongs and carries it first, according to the old practice, to the filer who removes the seam and the gate with a rasp.

This operation is faulty, because the filer often takes off too much metal on one side, and makes the shot sometimes too small; always more or less irregular in form: it is not practised with shot cast in sand, and might very well be also dispensed with for those which are cast in iron moulds, although their seam is thicker than that of the others. The workman who has carried the shot to the filer, takes it again, and places it under the hammer, where another turns it with the tongs so that it may be hammered in every direction, but principally on the seam and on the gate. It should receive from 120 to 150 blows of the hammer to pass inspection.

If the shot has not been rolled, it is necessary to prolong the hammering on the seam, in order to flatten it entirely; the yielding of the metal to this compression, produces an elongation towards the poles. This effect is imperceptible in shot which have been first rolled; because after that operation there remain but slight traces of the seam which disappear at the first blows of the hammer, and because, moreover, they ought to be heated and hammered at a low temperature.

A small stream of water is made to drop constantly on the shot; insinuating itself between the metal and the coat of oxide, it evaporates, throws off the scales, and increases the polish of the surface. When the shot has been sufficiently hammered, the workman who has brought it pushes it down with another, so that the hammer is not stopped. But in spite of the attention and skill of these workmen, it is impossible that a hammer which strikes 200 times in a minute, should not sometimes strike foul when the shot is changed; it would therefore be better to stop the hammer, either by supporting it with a prop, or disengaging it from the moving power. These foul strokes leave very deep marks, because the hammer and the anvil are both hollow and the edges are consequently very sharp. For the same reason even the hammer makes small marks, though much less perceptible than those of which we have just spoken, when it is badly fixed on the handle, or when, by use, it has been thrown out.

In passing from one caliber to another a little larger, it is not necessary to change the hammer or the anvil; it is sufficient to heat them a little, in their places, and to make the hammer strike on a cold hammered shot, of the caliber of those which are to be next hammered.

If the shot is not spherical when it comes from the mould, it can be made perfectly so by hammering, provided the inequalities are not too great, and that the metal is grey. A slight elongation then disappears entirely. A flattening at the poles is more difficult to correct.

Comparison between Shot cast in Iron Moulds and those cast in Sand.

Shot cast in iron moulds are generally less round than those cast in sand; they have besides the defect of a coating of white metal two or three lines thick, even when they have been cast from the best metal, that which is clear grey.

This coat of white metal proceeds from the sudden cooling of the metal when poured into these metallic moulds, which are undoubtedly the best conductors of heat. Owing to these two circumstances it is necessary to expose these shot to a high heat, for the white metal is difficult to hammer. Their surface becomes therefore much furrowed, and, notwithstanding, it is not always practical to make them spherical. There are also many kinds of iron which do not bear a great heat. Shot made of such iron, when heated to a rose red, begin to break under the hammer, the white metal

especially then breaks very easily, and yet it is this kind which requires a high heat in order that all the roughness may be removed.

Depressions and swellings, in short any defects of sphericity, will still appear after hammering, if the metal is white; and the shot will be besides too small.

Whatever care may be taken to skim the metal when it is poured into the mould, there will always enter a certain quantity of dross; the metal is also oxidated in passing through the air. This dross and this oxide, being at a high heat, may combine with the sand of the mould which absorbs them. In the iron moulds, on the contrary, they float on the surface of the metal, and collect at the upper pole of the shot, around the gate. These impurities are partly removed by hammering, and leave their impressions on the surface of the metal; another part of them is incrusted still more firmly on the surface of the shot which then becomes rough, uneven and scarred, or according to the expression of the workmen, *scabby*.

These defects are increased by the use of an impure metal, mixed with silex, such as the metal obtained by the use of coke of inferior quality: it may be known by its want of fluidity.

We see then that shot cast in iron moulds are defective:

1st. From want of uniformity of dimensions which prevents the requisite accuracy;

2nd. From want of sphericity;

3rd. From having a rough and furrowed surface, principally at the upper pole.

From these causes they are of a quality very inferior to that of shot cast in sand; there would besides be little gained by rolling shot cast in iron moulds, because their surface is too hard.

The faults just mentioned are not found to the same extent in all founderies, although they are inherent in this method of fabrication. On the other hand, shot which are cast in iron moulds, have a greater specific gravity than those cast in sand. This fact which seems at first sight so singular, is easily explained: we have already remarked that by a greater compression of the sand, we may obtain, with the same model, smaller shot than if the sand were loose, on account of the resistance offered to the expansion of the metal; now this resistance is very much increased by the use of iron moulds closely wedged together. Another cause of the greater specific gravity of such shot is connected with their greater defect, the coat of white metal which envelopes them, and which resists the operation of the hammer. There are some metals however, which are very little whitened by sudden cooling, and shot made of them, when cast in iron moulds, may be perfectly spherical after having been hammered.

Shot cast in sand, although always less indented than those cast in iron moulds, are yet somewhat so, and become more so in proportion as the metal is less pure and less fluid. This indented surface is owing to the scales of dross detached from it, or pressed into it by the hammer.

These impurities may be produced in the furnace, or they may adhere to the shot before they are taken to the furnace: accidental causes may also occasion them. Argillaceous sand, or mud adhering to the surface, may become vitrified in the fire by absorbing oxide of iron, and may produce indentations. A rusty shot has not so fine a surface after hammering as a clean one. It is therefore very improper to throw shot into the mud, or to expose them to rain, after they have been cast. The sand which comes from the mould, and which has not been entirely removed by the rasp, may

also occasion these defects; hence again the advantage of having shot rolled before they are hammered.

Cavities, more or less apparent, are great defects in shot; almost all shot have a cavity in the centre, and when there is none, it is remarked that the metal is less dense or more spongy there than in other parts: it always appears a little grey at that point, even if it is otherwise white. But the principal cause of rejection in some founderies, is the existence of small cavities near the superior pole of shot; these holes are often so small on the exterior that it is difficult to introduce a pin, but they are sometimes deep and always large within, and form real chambers. The shot cast of liquid white metal have not this defect; it appears more decidedly in proportion as the metal is less liquid and more grey. It is probably for the same reason, less sensible in shot cast in iron moulds.

The hammer does not afford a test of these shot which are full of little cavities; it breaks only those which are of white metal, or those which have been too much heated. Shot which are too small may be corrected by being heated and very slowly cooled, which is performed by placing them in hot cinders, or small live coals mixed with ashes, and letting them remain twenty-four or forty-eight hours. They must then be hammered a second time, because their surfaces become oxidized and very rough. These shot also are frequently made larger by hammering. It would therefore be a very bad way of trying to diminish the diameter of the shot by hammering it repeatedly. It can be done only by oxidizing it very much, which, at last, lessens the size of the shot by corrosion; but the surface becoming in that case very much indented, that operation should not be permitted.

It has been attempted to make use of broken or unserviceable projectiles, by recasting them in the Wilkinson furnace; but that operation which was performed in the arsenals has not been found, in any respect, advantageous. Cast-iron melted a second time, where it is of a good quality, generally gives better results than are obtained from the ore; but iron which is to be melted a second time ought to be of a grey colour, and obtained from ore of rather a refractory kind; it is also necessary that it be melted in crucibles of considerable height. When these conditions are not fulfilled, the metal cannot acquire sufficient fluidity, it becomes thick, white, and unfit for casting in moulds. Now the iron of broken projectiles, generally obtained from very fusible ores, almost always inclines to white; this tendency must be much increased by melting it in low furnaces; if the height of the crucibles were increased, a greater power would be required to move the bellows. It is to be remembered also, that good shot cannot be obtained without rolling and hammering, operations which require machinery, the establishment of which would be disproportioned to the object in view. These shot too, after having been rolled and hammered, would probably be inferior to those which may now be obtained at the founderies; since the material of them is not adapted for melting a second time, particularly when that operation is performed in low furnaces.

The experiments just mentioned, prove, however, that it is possible, by means of very simple contrivances, to make serviceable shot out of broken pieces, or shot of other calibers than those required. If therefore, in a besieged place, the supply of shot should fail, a certain quantity might be procured by this means: and if the quantity of material were sufficient to authorize it, a rolling barrel might be cast, and the shot would then be very good.

Of the inspection of Projectiles.

The following instruments are used for the inspection of projectiles:

1st. Cylinders, five calibers long, the diameter of which is one line less than that of the piece if for field pieces, and one line and a half for siege pieces.

2d. Three gauges, the largest has the same diameter as the cylinder, the smallest nine parts less for shot, one line less for bombs, and six parts less for six inch and twenty-four pound howitzes; the intermediate gauge is of use only to test the accuracy of the fabrication: if good, three-fourths at least of the projectiles ought not to pass through that gauge, although none can be rejected, if they should all pass through it. It was an error to prescribe, as was formerly done, to obtain projectiles of a mean diameter between the two gauges: the effort should always be to approach as nearly as possible to the larger.

3rd. Callipers, with gradual limbs, of different sizes, to measure the thickness of metal in hollow projectiles.

4th. Probes, or gauges, for measuring the thickness of metal at the point opposite to the eye.

5th. Cylinders for verifying the interior and exterior diameters of the eye.

6th. Gauges cut in small pieces of sheet iron, showing the maximum and minimum thickness of the shell at the eye.

7th. A hand hammer, with one face flat, and the other pointed.

8th. Benches, or tables, of thick plank.

9th. Fine pins for discovering and sounding cavities.

Of the inspection of Hollow Projectiles.

Under this head are included grenades, twenty-four pounders, six inch and eight inch howitzes; ten inch and twelve inch shells.

Before commencing the inspection, the instruments should first be carefully examined. The hollow cylinders as well as the ring gauges, are tested with verifying cylinders, intended for that purpose only. The gauges for the eye are measured with a nonius or else with a caliber ring made for the purpose. It is not necessary to make frequent verifications of these gauges, because their diameters cannot increase. Not so with the ring gauges, they should be verified whenever they are used, as the friction to which they are exposed in the inspections tends to increase their diameters.

The points of the callipers wear away very rapidly; they should therefore be frequently examined by closing them, and seeing if the points touch each other, when the upper branch corresponds to the zero of the graduated limb: the same remark applies to the probe.

The variations allowed in the thickness of the metal, or the differences between the respective maximum and minimum, are one line for twenty-four pounders, and six inch howitzes; two lines for eight inch shells, and four lines for ten and twelve inch. Formerly a variation of two lines was allowed for six inch howitzes, but one line is amply sufficient; eighteen parts would be enough for eight inch shells, and two lines for twelve inch; that is, one line above and one below the diameter of the intermediate gauge.

The variation allowed for the thickness of the culot, is generally one half of that allowed for the sides of the shell, except in six inch and twenty-four pound howitzes, in which the same variation is allowed, if indeed, they are not concentric.

There are no determinate variations allowed for the eyes; but Gassindi

recommends the rejection of shells the eyes of which differ three parts from the given dimensions. The exterior diameter differs one line from the interior, in bombs, and nine parts in howitzes.

The cylinder gauge is not used for bombs, and might without any inconvenience, be dispensed with for howitzes; it is much easier to judge of the roundness of these large projectiles, by applying the intermediate ring gauge, than by letting them roll through a cylinder inclined one inch in five calibers; as prescribed in the aide-memoire.

In order that the inspections may be made without confusion, and with proper accuracy and rapidity, the work should be divided between, at least, four inspectors, assisted by four or six gunners. One inspector holds the ring gauges, another measures the thickness of the shell at the eye and examines it with reference to flaws or cavities: a third verifies the thickness of metal at the sides; a fourth, the thickness at the bottom: the gunners clean the projectiles, place them on the bench, pass them from one inspector to another and then throw them on the pile to which they belong.

The inspector who has the ring gauges, rejects all the shells that will not pass through the larger gauge, or that pass through the smaller one, even in one direction. He distinguishes those that pass through the intermediate gauge, and they are placed in a separate pile, after they have passed the other inspectors. He examines them with respect to sphericity, which is easily judged of by the assistance of the gauges, and he rejects those which are either flattened or elongated at the poles.

The inspector whose business it is to examine the flaws or cavities, begins by measuring the thickness at the eye, he then inserts his finger, to discover interior cavities, which are sometimes numerous, and which are a cause of rejection. He afterwards examines the exterior, particularly at the gate, or near the eye. If he sees at once, that the metal is not compact, he searches the cavities and rejects the shell if he finds any cavity which becomes larger in the interior, or which extends to the depth of two lines. He strikes with the face of the hammer around the eye, to detach any scales that may be found there, and to judge by the sound, of the density of the metal. If he has doubts with regard to a cavity, he uses the point of the hammer, but cautiously, so as not to injure the shell too much; if there is a decided cavity, he strikes forcibly in order to lay it open, and to deface the shell which is then rejected. In the contrary case, if the dimensions of the eye are within the prescribed limits, and if there are no other defects, he passes the shell to the next inspector.

The inspector who has the callipers measures the thickness of the sides in four places: it is essential that the points of the callipers should be applied to the seam, the only circle on which the callipers can measure the normal thickness; the *minimum* thickness indicated by the callipers must be always taken. Finally, the shell is passed to the person who has the probe. The manner of using this instrument depends on its form. If it be so constructed that the stem can in any way be placed exactly in a direction perpendicular to the plane of the seam, and to the surface of the projectile, it is sufficient to place it with care, and to take the measure indicated, either by the nonius or by a simple division. When the probe has not such a construction, its position must be a little varied, as is done with the callipers; but the measure of the thickness of the culot must be the *maximum* shown by the instrument, because the greatest thickness is necessarily found on the line of the poles. These trials are very rapidly

made, a great facility being soon acquired by practice, because the requisite motions are few and limited.

It is to be observed that the sides of the eye do not serve as a guide for placing the stem of the probe in the direction of the line of the poles; the axis of the eye may often be out of that line, as we may suppose from the manner in which the shell is finished; the eye being reamed out when the metal is hot, and the reamer being guided only by the hand of the workman. Hence, the slightest deviation, almost imperceptible at the eye, will throw its axis out of the direction of the poles. On this account it is often requisite to vary a little the position of the instrument, which is also frequently rendered necessary by accidental circumstances met with in the shell; such as a slight cavity, or small projection, not sufficient to cause its rejection. In that case we must place the instrument by trial, even if it should have the advantage we have mentioned; as has for instance, the one invented by Col. Moret. It often happens, that a defect is not sufficiently great to cause the rejection of a shell, whilst it may still be rejected for a number of such small defects.

Bombs are inspected in the same manner as howitzes. Great attention should be paid to the ears, the metal of which is not always sound; that is the weak part of this kind of projectile. It is also necessary that the rings should have free play, and should fall down entirely on the surface of the shell. Bombs are scarcely ever rejected for the irregularities in the thickness of the sides, because the variations allowed are so great that even the least skilful workmen seldom exceed them.

Of the inspection of Shot.

The inspection of shot is much more simple than that of shells. When they are well cleaned, (and they should always be inspected as soon as they come from the foundery, before they become covered with rust,) they should be very carefully examined, and the cavities searched with a pin as in the case of shells. They are made to turn in the large gauge, and the small gauge is then applied to them in several directions: their roundness is judged of by means of the intermediate gauge. They are rejected for depressions, flaws, or other cavities of two lines in depth. Those that pass this inspection are made to roll through the cylinder gauge which should have an inclination of two inches in a length of five calibers. The shot which pass through the intermediate ring gauge, are placed in a separate pile.

The cylinder should be frequently turned that it may not be too much worn on one side. When a shot becomes wedged in the cylinder it is pushed out at the upper end, with a wooden handle. Formerly, when shot were cast in iron moulds, this accident very often occurred; not being spherical they sometimes passed very easily, in several directions, through the ring gauge, and afterwards stopped in the cylinder. About twenty of the shot received should be weighed; their weight is generally greater than that given in the tables, or than their denomination calls for; because it is endeavored to obtain shot which approach the dimensions of the large gauge, whilst the tables have been calculated on the diameter of the intermediate gauge. If this principle were strictly observed, the fabrication would be easier, but the shot would have greater windage than those which are now made, and in this respect, would be less serviceable.

The contractors remove at their own expense the projectiles which are rejected; but as their interest should be consulted as far as is compatible wit

that of the service, partial inspections are made at the founderies, and these give rise to the greater number of rejections.

Report of Thos. Jefferson Cram, Principal Assist. Prof. Nat. and Exp. Philos. U. S. Mil. Academy, upon experiments relative to the strength of Cast-iron beams.

[COMMUNICATED BY PROF. A. D. BACHE.]

1. Soon after the destructive conflagration which devoured a large and valuable portion of the city of New York, last winter, as a very natural consequence, the attention of capitalists became more fully awakened to the importance of constructing fire-proof buildings. Accordingly a demand was made upon Gov. Kemble, Esq. Principal of the West Point Foundry, for estimates of the cost of furnishing cast-iron, to replace the combustible parts which had hitherto been used in the interior of store houses and shops. To answer fully the demand which had been made upon him, Mr. Kemble thought it expedient to make a careful series of experiments upon the relative strengths of cast-iron beams of various forms, in order to ascertain, beyond a doubt, those which would be convenient for the particular object in view, and which would, at the same time, afford the greatest strength with the least cost. Through the politeness of Mr. Kemble, I had an opportunity of being present at the time of subjecting his cast-iron beams to the test of experiment; and believing that the results of those experiments will prove highly useful to the cause of constructions in general, the writer of this begs leave to make them public through the medium of the Journal of the Franklin Institute.

2. It is presumed that the accompanying drawings will enable the reader to understand the forms of the experimental beams, it being remarked, that, in each case, the form was such as would be generated by giving the figure representing the cross section, a motion of translation only, along a straight line—keeping the moving area constantly perpendicular to the line of motion. The lower rectangle, *e e, f, f,* would thus generate the "lower rib," and the upper rectangle *a a, b b,* would generate the "upper rib," of the beam; and the rectangle, *c, d, d, c,* would generate what we shall call the vertical plate of the beam. It will be seen at once, that almost any distribution of a given quantity of material, may be effected, by merely varying the dimensions of the rectangles in constructing the pattern for the casting.

3. The arrangement, for augmenting at pleasure, the pressure upon the beam, consisted of a combination of levers—one of which being a large Roman steelyard with a scale at the extremity of the longer arm: a small weight being placed on the scale, had its effect greatly augmented by the combined multiplying effects of the levers; and this increased effect was exerted by means of a cylindrical piece of iron laid straight across the middle of the top surface of the beam; so that the pressure acted uniformly along the transverse line of the middle of the upper surface of the beam. By this arrangement a small weight could be carefully applied to the scale of the steelyard without exerting a percussive effect.

4. In every case, the beam was supported by resting each of its extremities upon a well squared piece of iron about two inches in diameter, so that before exerting any pressure upon the beam, the bearing of each extremity was about two inches; and it may be well to remark here, that, immediately after the beam felt the pressure, the extremities bore only upon the inner

edges of the supporting pieces of iron; and hence, the "distance between the points of support" in what follows, must be regarded as the perpendicular distance between the inner surfaces of said supporting pieces of iron.

5. The pressures exerted are expressed in English pounds avoirdupois; the linear dimensions are expressed in English inches and parts, and the superficies in square inches. The dimensions were measured several times and when any difference was found, a mean of the whole was taken as the final result. The drawings are all made upon a uniform scale, the top and the front views containing, of course, but a small portion of the beam in length. The depressions recorded in the tables, were measured with the utmost care.

6. EXPERIMENT I.

Fig. 2.

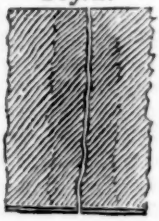

Fig. 4.

Fig. 3.

Fig. 1.

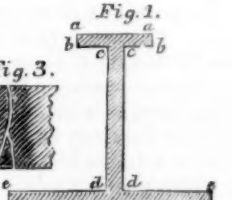

Fig. 1. represents a cross section of the beam.
Fig. 2. a top view of the fracture of the lower rib.
Fig. 3. " " upper "
Fig. 4. a side view of the fracture of the beam.

Dimensions, &c.

Depth, *a*, *b*, of upper rib,	0.31 in.	Breadth *a*, *a*, of upper rib,	2.36 in.
" *c*, *d*, of vertical plate,	4.15	Thickness *d*,*d*, of vert. plate	0.394
" *e*, *f*, of lower rib,	0.66	Breadth *f*, *f*, of lower rib,	6.74
total of the beam,	5.12		

Area *a*, *a*, *b*, *b*, of cross section of upper rib, (in sq. in. and parts,)			0.7316
" *c*, *d*, *d*, *c*, of	"	of vertical plate,	" 1.6351
" *e*, *e*, *f*, , of	"	of lower rib,	4.4484
" total of	"	of beam,	6.8151

Total length of beam, 60 inches; distance between points of support 54 inches; and weight of the beam 105 lbs.

Circumstances.

The pressure being exerted upon the top of the upper rib, the upper part of the beam experienced a compression of its particles; and the lower part an extension of its particles. Augmenting the pressure by degrees—so carefully however, as not to produce a percussive effect—the beam bent more and more as the pressure increased, until of a sudden it ruptured. The annexed table exhibits the depressions of the middle of the beam in proportion as the pressure was augmented.

Pressures upon the middle.	Depressions of the middle.
½ (105) = 52½ lbs.	0.00 in.
15676	0.28
17244	0.32
18028	0.34
19596	0.40
20380	0.42
21948	0.46
23516	0.52
25084	0.58
25868	Beam broke.

No indications of rupture were observed during the successive augmentations of the pressure, until the beam suddenly broke under the last pressure recorded in the table; and the whole time between the applications of the first and last pressures was nearly twenty-five minutes. The drawings faithfully exhibit the appearance of the fracture; and it will be perceived that the fracture of the top of the beam was produced by compression, and that of the bottom by extension. Dividing 25868 lbs. by 6.8151 square inches, it will be found that this beam broke under a pressure of 3796 lbs. per square inch of cross section; and an inspection of the table will show the circumstances of its resistance to flexure. It should be remarked, that this beam was cast on its side, and therefore had less strength than if it had been cast on end.

7. EXPERIMENT II.

Fig. 6.

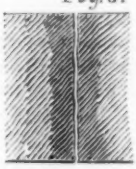

Fig 7.

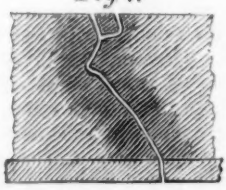

Fig. 5.

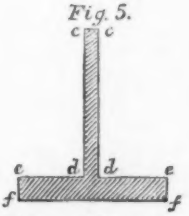

Fig. 5. represents a cross section of the beam at the place of fracture.
Fig. 6. a top view of the fracture of the lower rib.
Fig. 7. a side view of the fracture.

Dimensions, &c.

No upper rib,	0.00in.		
Depth *c*, *d*, of vertical plate	5.10	Thickness *c*, *c*, of vert. plate	0.46in.
" *e*, *f*, of lower rib,	0.74	Breadth *f*, *f*, of lower rib,	5.12
" total of beam,	5.84		
Area *c*, *c*, *d*, *d*, of cross section of vertical plate (in sq. in. and parts,)			2.346
" *e*, *e*, *f*, *f*, of cross section of lower rib,		"	3.7888
" total of cross section of beam,		"	6.1348

Total length of beam 60 inches; distance between points of support 54 inches; and weight of the beam 97 lbs.

Circumstances.

There was no upper rib to this beam; therefore the pressure was exerted upon the top, *c*, *c*, of the vertical plate so as to compress the upper parts of the beam and to extend the lower parts. The pressures were augmented at intervals of a few minutes, and with all possible care to prevent percussion. The following table contains the pressures exerted, and the corresponding depressions, which were carefully noted.

Pressures upon the middle.	Depressions of the middle.
$\frac{1}{2}$ (97) = 48½ lbs.	0.00 in.
15672	0.28
16456 ½	0.28
17240	0.32
18024	0.32
18808	0.36
19592	0.38
20376	0.40
21160	0.42
21944	0.46
22728	0.48
23512	0.54
24296	Beam broke.

No signs of a rupture appeared until all of a sudden the beam broke a few seconds after the application of the greatest pressure recorded in the table: the whole time between the applications of the first and last pressures, was about thirty minutes. The drawings show, that the fracture at the top was produced by compression, and that at the bottom, by extension of the particles of the beam. Dividing 24296 by 6.1348, we obtain 3960 lbs., for the pressure per square inch, of cross section, which this form of beam sustained before breaking. The table shows the state of the flexure at the different periods of the operation, and the drawings will explain the peculiarities of the fracture. This beam was cast on end; and it will be seen, that this form sustained more, before breaking, by 164 lbs. to the square inch of section, than that of Experiment I.

8. EXPERIMENT III.

Fig. 9.

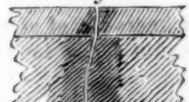

Fig. 8.

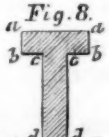

Fig. 8. is a cross section of the beam when rupture took place.

Fig. 9. a side view of the fracture. The fractures were nearly straight across the ribs.

Depth, *a*, *b*, of upper rib,	0.800in.		
" *c*, *d*, of vertical plate,	3.12	Breadth *a*, *a*, of upper rib,	2.42 in.
" *e*, *f*, of lower rib,	0.80	Thickness *c*, *c*, of vert. plate.	0.94
		Breadth, *e*, *e*, of lower rib,	2.42
" total of beam,	4.72		

Area *a*, *a*, *b*, *b*, of cross section of upper rib, (in sq. in. and parts,)		1.9360
" *c*, *c*, *d*, *d*, of cross section of vertical plate,	"	2.9328
" *e*, *e*, *f*, *f*, of cross section of lower rib,	"	1.9360
" total of cross section of beam,	"	6.8048

Total length of the beam 60 inches; distance between points of support 54 inches; and weight of the beam 102 lbs.

Circumstances.

This beam very suddenly broke under (the first pressure applied,) 15674 lbs. Indeed, it was doubtful even whether that amount of pressure had yet been fully exerted. Admitting however, that the whole pressure was felt, the beam broke under a pressure of only 2304 lbs. per square inch of cross section; and if the whole amount of pressure was not exerted, of course the beam was still less strong. This beam was cast on its side from the cupola furnace, and with no selection of metal, but all from one ladle. The sudden rupture of this beam made it impossible to measure the depressions. The drawing of the fracture would seem to indicate that it broke by extension.

EXPERIMENT IV.

9. The beam tried in this experiment, was exactly of the same form and dimensions as that of experiment II.; but it was not so good a casting. It was placed with its rib uppermost, in a manner exactly the reverse of that described in experiment II., so that the pressure was exerted upon the top surface of the rib, the beam resting with the edge of the vertical plate upon the supports; and thus causing a greater portion to experience compression, and a less portion to experience extension, than in either of the other experiments. Under these circumstances, the beam ruptured very suddenly even before the pressure arising from the apparatus of levers alone, had been brought to act fully upon the rib; thus affording a striking example of the great gain of strength, by giving a proper position to the beam with respect to the manner in which its different parts are to be strained—whether by compressing or by extending its particles.

10. Representing by 1.00 the strength of beam in experiment I., per sq. inch of cross section, the relative strengths of the different forms to resist rupture, will be expressed as follows:

Beam of the form described in	Exp. I.,	Strength to resist rupture,		1.00
Beam of "	Exp. II.,	"	"	1.04
Beam of "	Exp. III.,	"	"	0.44

By comparing the areas of the cross sections of the different forms, it will be seen that greater strength may be gained, at a less expense of metal, by giving the beam the form in experiments I. and II. instead of the form in experiment III.

All of which is respectfully submitted.

THO. JEFFERSON CHAM.

To Prof. A. D. BACHE, Univ. of Penn.

West Point, June 1836.

NEW PATENT LAW.

We insert the law recently passed, regulating the granting of patents for useful inventions. In many of its provisions it is undoubtedly a real improvement upon the old law; there are, however, some enactments in it which we think objectionable, and others, the beneficial operation of which, may admit of much doubt. The exercise of the judicial power given to the office will require much knowledge, great prudence, and a kind and liberal feeling towards applicants, in doubtful cases. Several alterations would have been urged previously to its passage, but in the state of Congressional business a trifling opposition would have defeated it altogether, and it was thought better to break up the old system, as amendments will be more readily grafted on the new, perfection not being looked for in what is untried. We shall offer some extended remarks upon this subject at an early day. EDITOR.

An act to promote the progress of useful arts, and to repeal all acts and parts of acts heretofore made for that purpose.

Be it enacted, by the Senate and House of Representatives of the United States of America in Congress assembled, that there shall be established and attached to the Department of State, an Office to be denominated the Patent Office; the chief officer of which shall be called the Commissioner of Patents, to be appointed by the President, by and with the advice and consent of the Senate, whose duty it shall be, under the direction of the Secretary of State, to superintend, execute, and perform, all such acts and things touching and respecting the granting and issuing of patents for new and useful discoveries, inventions, and improvements, as are herein provided for, or shall hereafter be, by law, directed to be done and performed, and shall have the charge and custody of all the books, records, papers, models, machines, and all other things belonging to said Office. And said Commissioner shall receive the same compensation as is allowed by law to the Commissioner of the Indian Department, and shall be entitled to send and receive letters and packages by mail, relating to the business of the office, free of postage.

SEC. 2. *And be it further enacted,* That there shall be, in said office, an inferior officer, to be appointed by the said principal officer, with the approval of the Secretary of State, to receive an annual salary of seventeen hundred dollars, and to be called the Chief Clerk of the Patent Office; who, in all cases during the necessary absence of the Commissioner, or when said principal office shall become vacant, shall have the charge and custody of the seal, and of the records, books, papers, machines, models, and all other things belonging to the said office, and shall perform the duties of Commissioner during such vacancy. And the said Commissioner may also, with like approval, appoint an examining clerk, at an annual salary of fifteen hundred dollars; two other clerks at twelve hundred dollars each, one of whom shall be a competent draughtsman; one other clerk at one thousand dollars; a machinist at twelve hundred and fifty dollars; and a messenger at seven hundred dollars. And said Commmissioner, clerks, and every other person appointed and employed in said office, shall be disqualified and interdicted from acquiring or taking, except by inheritance, during the period for which they shall hold their appointments, respectively, any right or interest, directly or indirectly, in any patent for an invention or discovery which has been, or may hereafter be, granted.

SEC. 3. *And be it further enacted*, That the said principal officer, and every other person to be appointed in the said office, shall, before he enters upon the duties of his office or appointment, make oath or affirmation, truly and faithfully to execute the trust committed to him. And the said Commissioner and the chief clerk shall also, before entering upon their duties, severally give bonds with sureties to the Treasurer of the United States, the former in the sum of ten thousand dollars, and the latter, in the sum of five thousand dollars, with condition to render a true and faithful account to him or his successor in office, quarterly, of all moneys which shall be by them respectively received for duties on patents, and for copies of records and drawings, and all other moneys received by virtue of said office.

SEC. 4. *And be it further enacted*, That the said Commissioner shall cause a seal to be made and provided for the said office, with such device as the President of the United States shall approve; and copies of any records, books, papers, or drawings, belonging to the said office, under the signature of the said Commissioner, or, when the office shall be vacant, under the signature of the chief clerk, with the said seal affixed, shall be competent evidence in all cases in which the original records, books, papers, or drawings, could be evidence. And any person making application therefor, may have certified copies of the records, drawings, and other papers deposited in said office, on paying, for the written copies, the sum of ten cents for every page of one hundred words; and for copies of drawings, the reasonable expense of making the same.

SEC. 5. *And be it further enacted*, That all patents issuing from said office shall be issued in the name of the United States, and under the seal of said office, and be signed by the Secretary of State, and countersigned by the Commissioner of said office, and shall be recorded, together with the descriptions, specifications, and drawings, in the said office, in books to be kept for that purpose. Every such patent shall contain a short description or title of the invention or discovery, correctly indicating its nature and design, and in its terms grant to the applicant or applicants, his or their heirs, administrators, executors, or assigns, for a term not exceeding fourteen years, the full and exclusive right and liberty of making, using, and vending to others to be used, the said invention or discovery, referring to the specifications for the particulars thereof, a copy of which shall be annexed to the patent, specifying what the patentee claims as his invention or discovery.

SEC. 6. *And be it further enacted*, That any person or persons having discovered or invented any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement on any art, machine, manufacture, or composition of matter, not known or used by others before his or their discovery or invention thereof, and not, at the time of his application for a patent, in public use or on sale, with his consent or allowance, as the inventor or discoverer; and shall desire to obtain an exclusive property therein, may make application in writing to the Commissioner of Patents, expressing such desire, and the Commissioner, on due proceedings had, may grant a patent therefor. But before any inventor shall receive a patent for any such new invention or discovery, he shall deliver a written description of his invention or discovery, and of the manner and process of making, constructing, using, and compounding the same, in such full, clear, and exact terms, avoiding unnecessary prolixity, as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound, and use the same;

and in case of any machine, he shall fully explain the principle and the several modes in which he has contemplated the application of that principle or character by which it may be distinguished from other inventions; and shall particularly specify and point out the part, improvement, or combination, which he claims as his own invention or discovery. He shall, furthermore, accompany the whole with a drawing, or drawings, and written references, where the nature of the case admits of drawings, or with specimens of ingredients, and of the composition of matter, sufficient in quantity for the purpose of experiment, where the invention or discovery is of a composition of matter; which descriptions and drawings, signed by the inventor and attested by two witnesses, shall be filed in the patent office; and he shall moreover furnish a model of his invention, in all cases which admit of a representation by model, of a convenient size to exhibit advantageously its several parts. The applicant shall also make oath or affirmation that he does verily believe that he is the original and first inventor or discoverer of the art, machine, composition, or improvement, for which he solicits a patent, and that he does not know or believe that the same was ever before known or used; and also of what country he is a citizen; which oath or affirmation may be made before any person authorized by law to administer oaths.

Sec. 7. *And be it further enacted*, That, on the filing of any such application, description, and specification, and the payment of the duty hereinafter provided, the Commissioner shall make or cause to be made, an examination of the alleged new invention or discovery; and if, on any such examination, it shall not appear to the Commissioner that the same had been invented or discovered by any other person in this country prior to the alleged invention or discovery thereof by the applicant, or that it had been patented or described in any printed publication in this or any foreign country, or had been in public use or on sale with the applicant's consent or allowance prior to the application, if the Commissioner shall deem it to be sufficiently useful and important, it shall be his duty to issue a patent therefor. But whenever, on such examination, it shall appear to the Commissioner that the applicant was not the original and first inventor or discoverer thereof, or that any part of that which is claimed as new had before been invented or discovered, or patented, or described in any printed publication in this or any foreign country, as aforesaid, or that the description is defective and insufficient, he shall notify the applicant thereof, giving him, briefly, such information and references as may be useful in judging of the propriety of renewing his application, or of altering his specification to embrace only that part of the invention or discovery which is new. In every such case, if the applicant shall elect to withdraw his application, relinquishing his claim to the model, he shall be entitled to receive back twenty dollars, part of the duty required by this act, on filing a notice in writing of such election in the Patent Office, a copy of which, certified by the Commissioner, shall be a sufficient warrant to the Treasurer for paying back to the said applicant the said sum of twenty dollars. But if the applicant in such case shall persist in his claim for a patent, with or without any alteration of his specification, he shall be required to make oath or affirmation anew, in manner as aforesaid. And if the specification and claim shall not have been so modified as, in the opinion of the Commissioner, shall entitle the applicant to a patent, he may, on appeal, and upon request in writing, have the decision of a board of examiners, to be composed of three disinterested persons, who shall be appointed for that purpose by the Secretary of State,

one of whom at least, to be selected, if practicable and convenient, for his knowledge and skill in the particular art, manufacture, or branch of science to which the alleged invention appertains; who shall be under oath or affirmation for the faithful and impartial performance of the duty imposed upon them by said appointment. Said board shall be furnished with a certificate in writing, of the opinion and decision of the Commissioner, stating the particular grounds of his objection, and the part or parts of the invention which he considers as not entitled to be patented. And the said board shall give reasonable notice to the applicant, as well as to the Commissioner, of the time and place of their meeting, that they may have an opportunity of furnishing them with such facts and evidence as they may deem necessary to a just decision; and it shall be the duty of the Commissioner to furnish to the board of examiners such information as he may possess relative to the matter under their consideration. And on an examination and consideration of the matter by such board, it shall be in their power, or of a majority of them, to reverse the decision of the Commissioner, either in whole or in part, and their opinion being certified to the Commissioner, he shall be governed thereby, in the further proceedings to be had on such application: *Provided, however*, That before a board shall be instituted in any such case, the applicant shall pay to the credit of the Treasury, as provided in the ninth section of this act, the sum of twenty-five dollars, and each of said persons so appointed shall be entitled to receive for his services in each case, a sum not exceeding ten dollars, to be determined and paid by the Commissioner out of any moneys in his hands, which shall be in full compensation to the persons who may be so appointed, for their examination and certificate as aforesaid.

Sec. 8. *And be it further enacted*, That whenever an application shall be made for a patent, which, in the opinion of the Commissioner, would interfere with any other patent for which an application may be pending, or with any unexpired patent, which shall have been granted, it shall be the duty of the Commissioner to give notice thereof to such applicants, or patentees, as the case may be; and if either shall be dissatisfied with the decision of the Commissioner on the question of priority of right or invention, on a hearing thereof, he may appeal from such decision, on the like terms and conditions as are provided in the preceding section of this act; and the like proceedings shall be had, to determine which or whether either of the applicants is entitled to receive a patent as prayed for. But nothing in this act contained shall be construed to deprive an original and true inventor of the right to a patent for his invention, by reason of his having previously taken out letters patent therefor in a foreign country, and the same having been published, at any time within six months next preceding the filing of his specification and drawing. And whenever the applicant shall request it, the patent shall take date from the time of the filing of the specification and drawings, not however exceeding six months prior to the actual issuing of the patent, and on like request, and the payment of the duty herein required, by any applicant, his specification and drawings shall be filed in the secret archives of the office until he shall furnish the model and the patent be issued, not exceeding the term of one year, the applicant being entitled to notice of interfering applications.

Sec. 9. *And be it further enacted*, That before any application for a patent shall be considered by the Commissioner as aforesaid, the applicant, shall pay into the Treasury of the United States, or into the Patent Office,

or into any of the deposite banks to the credit of the Treasury, if he be a citizen of the United States, or an alien, and shall have been a resident in the United States for one year next preceding, and shall have made oath of his intention to become a citizen thereof, the sum of thirty dollars; if a subject of the King of Great Britain, the sum of five hundred dollars; and all other persons the sum of three hundred dollars; for which payment duplicate receipts shall be taken, one of which to be filed in the office of the Treasurer. And the moneys received into the Treasury under this act, shall constitute a fund for the payment of the salaries of the officers and clerks herein provided for, and all other expenses of the Patent Office, and to be called the patent fund.

Sec. 10. *And be it further enacted*, That where any person hath made, or shall have made, any new invention, discovery, or improvement, on account of which a patent might by virtue of this act be granted, and such person shall die before any patent shall be granted therefor, the right of applying for and obtaining such patent shall devolve on the executor or administrator of such person, in trust for the heirs at law of the deceased, in case he shall have died intestate; but if otherwise, then in trust for his devices, in as full and ample manner, and under the same conditions, limitations, and restrictions, as the same was held, or might have been claimed or enjoyed by such person in his or her lifetime; and when application for a patent shall be made by such legal representatives, the oath or affirmation provided in the sixth section of this act, shall be so varied as to be applicable to them.

Sec. 11. *And be it further enacted*, That every patent shall be assignable in law, either as to the whole interest, or any undivided part thereof, by any instrument in writing; which assignment, and also every grant and conveyance of the exclusive right under any patent, to make and use, and to grant to others to make and use, the thing patented within and throughout any specified part or portion of the United States, shall be recorded in the Patent Office within three months from the execution thereof, for which the assignee or grantee shall pay to the Commissioner the sum of three dollars.

Sec. 12. *And be it further enacted*, That any citizen of the United States, or alien, who shall have been a resident in the United States one year next preceding, and shall have made oath of his intention to become a citizen thereof, who shall have invented any new art, machine, or improvement thereof, and shall desire further time to mature the same, may, on paying to the credit of the Treasury, in manner as provided in the ninth section of this act, the sum of twenty dollars, file in the Patent Office a caveat, setting forth the design and purpose thereof, and its principal and distinguishing characteristics, and praying protection of his right, till he shall have matured his invention; which sum of twenty dollars, in case the person filing such caveat shall afterwards take out a patent for the invention therein mentioned, shall be considered a part of the sum herein required for the same. And such caveat shall be filed in the confidential archives of the office, and preserved in secrecy. And if application shall be made by any other person within one year from the time of filing such caveat, for a patent of any invention with which it may in any respect interfere, it shall be the duty of the Commissioner to deposite the description, specifications, drawings, and model, in the confidential archives of the office, and to give notice, by mail, to the person filing the caveat, of such application, who shall, within three months after receiving the notice, if he would avail himself of the benefit of his caveat, file his description, specifications, drawings,

and model; and if, in the opinion of the Commissioner, the specifications of claim interfere with each other, like proceedings may be had in all respects as are in this act provided in the case of interfering applications: *Provided, however*, That no opinion or decision of any board of examiners, under the provisions of this act, shall preclude any person interested in favor of or against the validity of any patent which has been or may hereafter be granted, from the right to contest the same in any judicial court in any action in which its validity may come in question.

SEC. 13. *And be it further enacted*, That whenever any patent which has heretofore been granted, or which shall hereafter be granted, shall be inoperative or invalid, by reason of a defective or insufficient description or specification, or by reason of the patentee claiming in his specification as his own invention, more than he had or shall have a right to claim as new, if the error has, or shall have arisen by inadvertency, accident, or mistake, and without any fraudulent or deceptive intention, it shall be lawful for the Commissioner, upon the surrender to him of such patent, and the payment of the further duty of fifteen dollars, to cause a new patent to be issued to the said inventor, for the same invention, for the residue of the period then unexpired for which the original patent was granted, in accordance with the patentee's corrected description and specification. And in case of his death, or any assignment by him made of the original patent, a similar right shall vest in his executors, administrators, or assignees. And the patent so reissued, together with the corrected description and specification, shall have the same effect and operation in law, on the trial of all actions hereafter commenced for causes subsequently accruing, as though the same had been originally filed in such corrected form, before the issuing of the original patent. And whenever the original patentee shall be desirous of adding the description and specification of any new improvement of the original invention or discovery which shall have been invented or discovered by him subsequent to the date of his patent, he may, like proceedings being had in all respects as in the case of original applications, and on the payment of fifteen dollars, as hereinbefore provided, have the same annexed to the original description and specification; and the Commissioner shall certify, on the margin of such annexed description and specification, the time of its being annexed and recorded; and the same shall thereafter have the same effect in law, to all intents and purposes as though it had been embraced in the original description and specification.

SEC. 14. *And be it further enacted*, That whenever, in any action for damages for making, using, or selling the thing whereof the exclusive right is secured by any patent heretofore granted, or by any patent which may hereafter be granted, a verdict shall be rendered for the plaintiff in such action, it shall be in the power of the court to render judgment for any sum above the amount found by such verdict as the actual damages sustained by the plaintiff, not exceeding three times the amount thereof, according to the circumstances of the case, with costs; and such damages may be recovered by action on the case, in any court of competent jurisdiction, to be brought in the name or names of the person or persons interested, whether as patentee, assignees, or as grantees of the exclusive right within and throughout a specified part of the United States.

SEC. 15. *And be it further enacted*, That the defendant in any such action shall be permitted to plead the general issue, and to give this act and any special matter in evidence, of which notice in writing may have been given to the plaintiff or his attorney, thirty days before trial, tending to

prove that the description and specification filed by plaintiff does not contain the whole truth relative to his invention or discovery, or that it contains more than is necessary to produce the described effect; which concealment or addition shall fully appear to have been made for the purpose of deceiving the public, or that the patentee was not the original and first inventor or discoverer of the thing patented, or of a substantial or material part thereof claimed as new, or that it had been described in some public work anterior to the supposed discovery thereof by the patentee, or had been in public use, or on sale with the consent and allowance of the patentee before his application for a patent, or that he had surreptitiously or unjustly obtained the patent for that which was in fact invented or discovered by another, who was using reasonable diligence in adapting and perfecting the same; or that the patentee, if an alien at the time the patent was granted, had failed and neglected for the space of eighteen months from the date of the patent, to put and continue on sale to the public, on reasonable terms, the invention or discovery for which the patent was issued; in either of which cases judgment shall be rendered for the defendant, with costs. And whenever the defendant relies in his defence on the fact of a previous invention, knowledge, or use of the thing patented, he shall state, in his notice of special matter, the names and places of residence of those whom he intends to prove to have possessed a prior knowledge of the thing, and where the same had been used: *Provided, however,* That whenever it shall satisfactorily appear that the patentee, at the time of making his application for the patent, believed himself to be the first inventor or discoverer of the thing patented, the same shall not be held to be void on account of the invention or discovery or any part thereof having been before known or used in any foreign country, it not appearing that the same or any substantial part thereof had before been patented or described in any printed publication. *And provided, also,* That whenever the plaintiff shall fail to sustain his action on the ground that in his specification of claim is embraced more than that of which he was the first inventor, if it shall appear that the defendant had used or violated any part of the invention justly and truly specified and claimed as new, it shall be in the power of the court to adjudge and award as to costs as may appear to be just and equitable.

Sec. 16. *And be it further enacted,* That whenever there shall be two interfering patents, or whenever a patent on application shall have been refused on an adverse decision of a board of examiners, on the ground that the patent applied for would interfere with an unexpired patent previously granted, any person interested in any such patent either by assignment or otherwise, in the one case, and any such applicant in the other case, may have remedy by bill in equity; and the court having cognizance thereof, on notice to adverse parties and other due proceedings had, may adjudge and declare either the patents void in the whole or in part, or inoperative and invalid in any particular part or portion of the United States, according to the interest which the parties to such suit may possess in the patent or the inventions patented, and may also adjudge that such applicant is entitled, according to the principles and provisions of this act, to have and receive a patent for his invention, as specified in his claim, or for any part thereof, as the fact of priority of right or invention, shall in any such case be made to appear. And such adjudication, if it be in favor of the right of such applicant, shall authorize the Commissioner to issue such patent, on his filing a copy of the adjudication, and otherwise complying with the requisitions of this act. *Provided, however,* That no such judgment or adjudication shall affect

the rights of any person except the parties to the action and those deriving title from or under them, subsequent to the rendition of such judgment.

Sec. 17. *And be it further enacted*, That all actions, suits, controversies, and cases arising under any law of the United States, granting or confirming to inventors the exclusive right to their inventions or discoveries, shall be originally cognizable, as well in equity as at law, by the circuit courts of the United States, or any district court, having the powers and jurisdiction of a circuit court; which courts shall have power upon bill in equity, filed by any party aggrieved, in any such case, to grant injunctions, according to the course and principles of courts of equity, to prevent the violation of the rights of any inventor as secured to him by any law of the United States, on such terms and conditions as said courts may deem reasonable: *Provided, however*, That from all judgments and decrees, from any such court, rendered in the premises, a writ of error or appeal, as the case may require, shall lie to the Supreme Court of the United States, in the same manner and under the same circumstances as is now provided by law, in other judgments and decrees of circuit courts, and in all other cases in which the court shall deem it reasonable to allow the same.

Sec. 18. *And be it further enacted*, That whenever any patentee of an invention or discovery shall desire an extension of his patent beyond the term of its limitation, he may make application therefor, in writing to the Commissioner of the Patent Office, setting forth the grounds thereof; and the Commissioner shall, on the applicant's paying the sum of forty dollars to the credit of the Treasury, as in the case of an original application for a patent, cause to be published, in one or more of the principal newspapers in the city of Washington, and in such other paper or papers as he may deem proper, published in the section of country most interested adversely to the extension of the patent, a notice of such application and of the time and place, when and where the same will be considered, that any person may appear and show cause why the extension should not be granted. And the Secretary of State, the Commissioner of the Patent Office, and the Solicitor of the Treasury, shall constitute a board to hear and decide upon the evidence produced before them both for and against the extension, and shall sit for that purpose at the time and place designated in the published notice thereof. The patentee shall furnish to said board a statement, in writing, under oath, of the ascertained value of the invention, and of his receipts and expenditures, sufficiently in detail to exhibit a true and faithful account of loss and profit in any manner accruing to him from and by reason of said invention. And if, upon a hearing of the matter, it shall appear to the full and entire satisfaction of said board, having due regard to the public interest therein, that it is just and proper that the term of the patent should be extended, by reason of the patentee, without neglect or fault on his part, having failed to obtain, from the use and sale of his invention, a reasonable remuneration for the time, ingenuity, and expense bestowed upon the same, and the introduction thereof into use, it shall be the duty of the Commissioner to renew and extend the patent, by making a certificate thereon of such extension, for the term of seven years, from and after the expiration of the first term; which certificate, with a certificate of said board of their judgment and opinion as aforesaid, shall be entered on record in the Patent Office; and thereupon the said patent shall have the same effect in law as though it had been originally granted for the term of twenty-one years. And the benefit of such renewal shall extend to assignees and grantees of the right to use the thing patented, to the extent of their

respective interest therein: *Provided, however,* That no extension of a patent shall be granted after the expiration of the term for which it was originally issued.

Sec. 19. *And be it further enacted,* That there shall be provided for the use of said office, a library of scientific works and periodical publications both foreign and American, calculated to facilitate the discharge of the duties hereby required of the chief officers therein, to be purchased under the direction of the Committee of the Library of Congress. And the sum of fifteen hundred dollars is hereby appropriated for that purpose, to be paid out of the patent fund.

Sec. 20. *And be it further enacted,* That it shall be the duty of the Commissioner to cause to be classified and arranged, in such rooms or galleries as may be provided for that purpose, in suitable cases, when necessary for their preservation, and in such manner as shall be conducive to a beneficial and favorable display thereof, the models and specimens of compositions and of fabrics and other manufactures and works of art, patented or unpatented, which have been, or shall hereafter be deposited in said office. And said rooms or galleries shall be kept open during suitable hours for public inspection.

Sec. 21. *And be it further enacted,* That all acts and parts of acts heretofore passed on this subject, be, and the same are hereby repealed: *Provided, however,* That all actions and processes in law or equity sued out prior to the passage of this act, may be prosecuted to final judgment and execution, in the same manner as though this act had not been passed, excepting and saving the application to any such action, of the provisions of the fourteenth and fifteenth sections of this act, so far as they may be applicable thereto. *And provided, also,* That all applications or petitions for patents, pending at the time of the passage of this act, in cases where the duty has been paid, shall be proceeded with and acted on in the same manner as though filed after the passage thereof.

James K. Polk,
Speaker of the House of Representatives.
W. R. King,
President of the Senate, pro tempore.

Approved, July 4th, 1836.
Andrew Jackson.

Physical Science.

History of experiments on atmospheric electricity, being a report presented by a Committee of the "Franklin Kite Club," at the request of the Club.*

The Committee appointed to enquire into the history of experiments, upon the electricity of the atmosphere; having given such attention to the subject as their other engagements would allow: beg leave to submit the following report:

The fact that amber and some gems, when excited by friction, possessed the curious property of attracting light bodies; was known to philosophers several centuries before the christian era. Nothing further, however,

* John C. Cresson, Esq. Chairman.

than this simple fact, seems to have been ascertained for the space of two thousand years.

The first modern experiments upon record were those of Dr. Gilbert of Colchester, an account of which he published about the year 1600, in a treatise de magnete. Although several philosophers repeated the experiments of Gilbert, and somewhat augmented the list of electric substances, no discovery of importance was effected until about the year 1670, at which period Otto Guericke, celebrated as the inventor of the air pump, constructed the first electrical machine of which we have any account, and acquired an additional title to renown, by discovering the light and sound by which the electric fluid is accompanied.

The existence of electric light was observed shortly afterwards in England, by Dr. Wall, to whom also is due the honor of first suggesting the idea of a resemblance between electricity and lightning.

This resemblance was afterwards noticed by Mr. Stephen Gray, who flourished about the year 1730; and still later by the Abbe Nollet; but neither of them appears to have attempted any investigation of the subject. The complete solution of this interesting problem in electrical science was reserved for our venerated countryman, Franklin; who at an early period of his investigations, became strongly impressed with the idea that lightning and electricity were identical. He accordingly drew up a statement of the principal points of resemblance between them, and suggested a plan for proving the truth of his theory, by elevating pointed conductors upon a lofty tower or spire. This paper, together with several others upon the same subject, he transmitted to his friend Mr. Collinson of London, by whom they were communicated to the Royal Society.

The reception which these essays met with in that learned body was by no means flattering, as will be perceived from the following extract from Franklin's Memoirs. "Obliged as we were to Mr. Collinson, for the present of the tube, &c., I thought it right he should be informed of our success in using it, and wrote him several letters containing accounts of our experiments. He got them read in the Royal Society, where they were not at first thought worthy of so much notice as to be printed among their transactions. One paper which I wrote for Mr. Kinnersly, on the sameness of lightning and electricity was read, but was laughed at by the connoiseurs." The papers being afterwards shown to Dr. Fothergill, he thought them of too much importance to be stifled, and advised the printing of them. They were accordingly published in a pamphlet form by Cave, a bookseller in London, with a preface by Dr. Fothergill. A copy of this pamphlet happening to fall into the hands of Buffon the naturalist, this eminent philosopher was so well satisfied of the justness of Franklin's views, that he determined on making the attempt to draw down lightning from the clouds. Accordingly, he raised an insulated rod of iron upon the tower of Montbar, and prevailed upon M. D'Alibard, to prepare an apparatus for the same purpose at Marly La Ville, about six miles from Paris. This apparatus consisted of a pointed iron rod, about forty feet long and an inch in diameter, the lower extremity of which was brought into a sentry box and insulated upon a table with glass feet. M. D'Alibard entrusted the charge of his apparatus to a man named Coiffier, who having served fourteen years in the dragoons, was supposed to have sufficient courage for such an undertaking.

We have been thus particular in our description of this machine, because it was the first to receive a visit from the ethereal fire; and shall now pro-

ceed to give a narrative of that important event, extracted from a paper laid before the Royal Academy of Science, at Paris, three days after the occurrence. "On Wednesday, the 10th of May, 1752, between two and three o'clock in the afternoon, M. Coiffier, an old dragoon, whom I had entrusted to make observations in my absence, hearing a pretty loud clap of thunder immediately flies to the machine, taking with him a vial in which was fixed a brass wire; on presenting the point of the wire to the rod he sees a small brilliant spark issue from it, and hears a crackling noise; he takes a second spark stronger than the first and with a louder noise! He call his neighbors and sends for M. Raulet, the Prior of Marly. The Prior runs with all his might, and the parishioners seeing his haste imagine that poor Coiffier had been killed by the thunder; the alarm spread throughout the village, and the hail which succeeded did not prevent them from following their Pastor.

The honest ecclesiastic arrived at the machine, and seeing there was no danger, tries the experiment himself, and takes some strong sparks. The hail storm was not more than a quarter of an hour in passing the zenith of our machine and there was no more thunder after the first clap." As soon as the cloud had passed and they could get no more sparks from the rod, the Prior despatched M. Coiffier with the following hasty letter.

"I announce to you sir, the fulfilment of your expectations: the experiment is complete. This day, at twenty minutes after two in the afternoon, it thundered directly over Marly, the clap was pretty loud. The desire to please you, and curiosity, induced me at once to quit my arm chair, in which I was engaged reading. I was hastening to M. Coiffier, and met on the road a child whom he had despatched to call me, I redoubled my speed through a torrent of hail. Arriving at the spot where the rod was placed, I took a brass wire and advancing it towards the rod, when within about an inch and a half, a small column of blueish flame with a smell like sulphur, sprung with wonderful quickness to the point of the wire, and occasioned a noise as if the rod had been struck with a key. I repeated the experiment at least six times in about five minutes, each experiment requiring about the time of a Pater and an Ave. I wished to continue them but the action of the fire gradually abated, and at length ceased altogether. The stroke of thunder which had occasioned this event was not followed by any other and the whole was terminated by a copious shower of hail.

I was so engaged during the experiment, that receiving a blow upon my arm above the elbow, I could not tell whether it proceeded from the brass wire or the rod. I did not complain at the moment, but the pain continuing on returning home, I uncovered my arm in the presence of Coiffier, and we perceived a contusion around it, such as would be caused by a blow from the wire upon the bare skin. When returning with Coiffier, I met the Curate, M. de Milley and the schoolmaster, to whom I reported what had happened. They all three perceived a smell of sulphur, which increased as they approached me: this odour was also perceived by the servants before I said any thing to them about it.

You have here, sir, a hasty recital, but it is correct and true, and I assure you that I am prepared to testify to these facts on all occasions. Coiffier was the first to make the experiment, and he repeated it several times before he sent for me. If any other testimony besides his and mine is necessary you can obtain it. Coiffier is in haste to depart. I am yours with respectful consideration. RAULET, *Prior of Marly.*"

May 10, 1753.

Immediately upon the announcement of M. D'Alibard's success, M. Delor demonstrator of physick, at Paris, erected a bar of iron upon his dwelling for the purpose of repeating the experiment, and succeeded in procuring several sparks during a thunder storm on the 18th day of May. On the 19th of the same month, Buffon obtained a similar result at Montbar.

Thus was Franklin's hypothesis verified in Europe, while its illustrious author was waiting for the erection of a spire at Philadelphia, by which he should be enabled to reach what he supposed to be the proper region for experiment. At length he devised the simple expedient of using a common kite for the attainment of his object, and in June, 1752, about a month after the French discoveries, but before any report of them had reached America, he performed his celebrated experiment.

Although it may seem unnecessary to repeat in this place a narrative with which every school boy is familiar, we shall, nevertheless, annex an account of this famous experiment, believing the omission would leave our report defective in a very essential point. The kite used by Franklin on this occasion, was made by extending a silk handkerchief upon two crossed sticks. To the upright stick was affixed an iron point.

The string was of hemp, except a small portion of the lower end, which was of silk: where the hempen string terminated a key was fastened. With this apparatus, on the approach of a thunder storm, he repaired to an open field accompanied by his son, to whom alone he had communicated his intention.

Having raised his kite, he placed himself under a shed, to avoid the rain and preserve the insulation of his silk cord. A thunder cloud passed over the kite and no sign of electricity appeared. When, almost despairing of success, he observed the loose fibres of the string become erect as if they were repelled. He now presented his knuckle to the key and received a strong spark; others succeeded even before the string was wet; but when the string was thoroughly wetted by the rain, he collected the electric fire in great abundance.

Franklin afterwards erected an insulated rod upon his house, by means of which he continued to investigate the subject for several years, in conjunction with his friend Mr. Kinnersly. The new field of discovery thus opened to the votaries of science, was speedily entered by a host of experimenters. Of these, it will be necessary to name only a few of the more prominent, whose experiments and discoveries embrace all that it is interesting to know.

In England, the first attempts to repeat these experiments, were made by Mr. Canton and Dr. Bevis; but owing to the unfavorable nature of the climate, or some defect in their apparatus, it was not until after numerous disappointments that they succeeded in obtaining some feeble indication of electricity. The most splendid experiments that have come under the notice of the Committee, were those made in France by M. De Romas, assessor of the Presidial of Nerac.* This gentleman made use of a kite which was seven feet five inches in height, and three feet in its greatest width, having above eighteen square feet of surface. The string was wrapped with copper wire somewhat after the manner of the base string of a violin.

On the 7th of June, 1753, at one o'clock, it thundered in the west; at

* A full account of these experiments may be found in the Memoirs de Savans Etrangers, published by the French Academy.

half past two M. De Romas, had raised his kite with a cord 780 feet long, inclined at an angle of 45° nearly; so that the elevation of the kite was about 550 feet. To the lower end of the cord he tied a ribbon of silk about three and a half feet long; this was brought under cover of a pent house and was there fastened to a heavy stone. Near the junction of the cord and ribbon was suspended a tube of tin one foot long and an inch in diameter, from which the sparks were to be drawn.

He had prepared a discharging rod with a glass handle twelve inches long, and provided with a brass chain of sufficient length to touch the ground when sparks were drawn from the tube. By means of the discharging rod he at first obtained sparks as large as those produced by a good globe, and several of his assistants drew sparks with keys and with the naked finger. This performance continued about twenty-two minutes, when the electricity disappeared; the little black clouds from which it was procured having passed from the zenith of the kite. In about seven minutes the electricity re-appeared, but was at first very feeble; it gradually increased, and sparks were drawn by the fingers, canes, and swords, of the spectators. M. De Romas now touched the tube with his knuckle, and received a terrible shock, such as he had never experienced from the Leyden vial charged by the best globes. Seven or eight of the bystanders having joined hands received sparks which struck the feet of the fifth person. The storm now approached and increased in violence, not a drop of rain had fallen; but in the zenith of the kite and about 60° around it, there were black clouds, which indicated a great increase of electricity.

M. De Romas therefore, thought proper to receive sparks only by the discharge; and in this manner drew several sparks more than two inches long and of proportionate thickness. After this, the electricity became so strong, that instead of sparks sheets of fire three inches long and three lines in diameter, flashed to the distance of more than a foot from the tube. At this time, when about three feet from the cord, he felt a sensation as if a spider's web was upon his face. He advised his assistants to keep at a greater distance, and himself retired about two feet; and when five feet from the cord, he again perceived the same sensation and retired still further. M. De Romas now paused to observe what took place in the clouds above the kite; there was no lightning, almost no thunder, and not any rain, the wind was west and so strong that the kite rose about 100 feet higher than at first. Having cast his eyes upon the tin tube which was about three feet from the ground; he observed three straws about a foot long, and others four and five inches in length, standing erect upon the ground and dancing in a ring beneath the tube like puppets. This little spectacle lasted about fifteen minutes, after which some drops of rain fell and he again felt the spider web sensation, and heard a rustling noise like the sound of a small forge bellows. This was considered a warning of a new increase of electricity, and he cautioned his assistants to retire to a greater distance. Now came the last act of this magnificent drama, which M. De Romas says made him tremble. The longest straw was attracted by the tube, and then followed an explosion which some compared to the noise of a petard, and others to the sound of a large earthen jar dashed upon a pavement. The fire which accompanied this explosion had the form of a spindle eight inches long and four or five lines in diameter. The straw which had caused the explosion followed the string of the kite and was seen at the distance of forty or fifty toises going with great rapidity, alternately attracted and repelled, every attraction being accompanied by sheets of fire

and continual explosions. During this part of the exhibition there was a strong smell of sulphur, and around the string there appeared a cylinder of permanent light three or four inches in diameter; which, it was supposed, would have appeared to be four or five feet in diameter if the experiment had been made at night. Shortly after this the wind shifted to the east and the rain fell abundantly, followed by some hail, so that they were unable to keep the kite up any longer; as it fell the string came in contact with a roof; the kite was made to rise again, and as soon as it was released from the roof the person who held the string received such a violent blow in his hands that he was compelled to relinquish it. The string now became slack and falling upon the feet of one of the assistants, he felt a concussion almost insupportable. On the 16th of August, 1757, M. De Romas, having again raised his kite with a cord more than 1000 feet in length, obtained results even more astonishing than those just narrated.

In a letter to the Abbé Nollet, giving an account of this experiment, he says, "imagine to yourself sheets of fire nine or ten feet in length, and one inch in diameter, with a noise like the report of a pistol: in less than an hour I had certainly thirty flashes of these dimensions without counting a thousand others of seven feet and under."

The dangerous nature of these experiments was fearfully illustrated about this time, by an accident which created a deep sensation throughout the scientific world. Prof. Richman, of St. Petersburgh, being engaged in a treatise upon electricity, had erected upon his house an apparatus for observing the electrical condition of the atmosphere, during thunder storms. On the 6th of August, 1753, while attending the usual meeting of the Imperial Academy of Sciences, a little before noon he heard the sound of distant thunder, and hastened home accompanied by Mr. Sokolow, engraver to the Academy. Upon examining the electrometer which was attached to his apparatus, Richman remarked that the thread pointed to four degrees on the quadrant; and described to Mr. Sokolow, the dangerous consequences that might ensue if the electricity should increase to 45° or more. At this moment while Mr. Richman was in a stooping posture with his head about a foot distant from the rod, a globe of white and blue fire about the size of a man's fist appeared between the machine and Mr. Richman's head. At the same time a sort of steam or vapour arose which stupefied the engraver and made him sink down, so that he could not remember to have heard the thunder which was very loud.

As soon as Mrs. Richman heard the loud clap of thunder she hastened to her husband's chamber, fearful of some bad consequences, and found him entirely lifeless, sitting upon a chest which happened to be placed behind him, and leaning against the wall.

After this unfortunate occurrence, electricians became more circumspect in experimenting upon an agent so dangerous and intractable. The phenomena of thunder storms having been investigated to a considerable extent, philosophers next directed their attention to observations upon the ordinary electrical condition of the atmosphere and the changes to which it is subject. Experiments of this kind were prosecuted in America, by Mr. Kennersley, the friend and associate of Franklin; in France by M. Le Monnier, and the Abbé Mazeas; in Switzerland by M. De Saussure; and in England by Mr. Cavallo, Mr. Read, and several others. But the labours of these philosophers although of great value and interest, fall very far short of those achieved by Signior Beccaria, of Turin; who continued a series of accurate experiments through a period of twenty years.

The observations of this eminent philosopher, were made in all kinds of weather and every season of the year. He made use of a great variety of instruments, and employed numerous assistants, sometimes causing simultaneous observations to be made at several distant places. As the limits of this report will not allow a detailed account of the phenomena observed by all these philosophers, it is deemed advisable to furnish a condensed statement of the general results, upon which most of the observers agree in a very satisfactory manner.

In calm, clear, dry weather, the electricity was always perceptible and invariably positive. It was more abondant in winter than in summer. During a rain it was generally negative, but it sometimes became positive while the rain was falling; and on some occasions these changes occurred several times in the course of a single storm.

In cloudy, damp, or windy weather, it was mostly positive but feeble. The quantity always increased with the length and elevation of the conductor; insulated strings extended horizontally, sometimes gave strong indications of electricity; a cord 1,500 Paris feet in length, extended across the river Po, was found to be as strongly electrified during a shower unattended by thunder, as a rod of metal had been during a thunder storm.

The latest of these experiments were made about the year 1791; since which period the interesting phenomena brought to light by the discovery of galvanism, have so much engrossed the attention of philosophers, that the other branches of electrical science have been comparatively neglected.

As far as the committee have been able to extend their researches, it appears that the observers of atmospheric electricity, have confined their experiments to a region of comparatively very small elevation, none of them having attained a greater distance from the surface of the earth, than one thousand feet; and even the few who reached this height, made use of such imperfect conductors, as were not calculated to furnish accurate results. It therefore seems probable, that a course of experiments made with good conductors elevated to the height of ten or fifteen thousand feet, would furnish such an addition to our knowledge of this interesting subject, as would fully compensate the labour and expense necessary for their prosecution.

Notice of the "Report on the new map of Maryland, 1835."

To the Editor of the Journal of the Franklin Institute.

Sir:—I send to you for insertion in the Journal of the Franklin Institute, a notice of the report of the gentlemen appointed under a law of Maryland, to make a Topographical and Geological survey of that state. The examination has manifestly been confided to able hands, and I think sir, that you will concur with me in the conclusion that the course adopted by Prof. Ducatel, in devoting so large a portion of investigations and observations in the first instance, to those deposits and formations which may be at once available by the cultivator of the soil, is, in every point of view, most judicious.

The state of Maryland has been among the first of the Union to adopt the liberal and enlightened policy, which there is now good ground to hope will become general. The report for 1835, is the third which has been made since the commencement of the survey of Maryland, and it will be seen that she will be in possession of an exact description of her surface, topographically as well as an examination into the constituents of her soil geologically, by which her resources will be developed, and her geographical limits and positions be determined. The construction of her new topographical and

geological map was commenced, and has been continued under the direction of J. H. Alexander, Esq. and Prof. J. T. Ducatel of the University of Maryland, the former having charge of the topographical, and the latter the geographical department. The report whose title stands at the head of this notice, was submitted to the Governor of the state during the last winter, and embraces a detail of the progress of the work during last year. It exhibits industry and intelligence, combined with the requisite scientific attainments for an exact and useful survey, and does credit to the already well established characters of the gentlemen engaged in its execution. The report is divided into two separate and distinct papers, each emanating from the respective officers, and treating exclusively of the matters peculiarly referred to his charge. That of the topographer, is chiefly occupied with details of local surveys, to which his attention had been especially directed by resolutions of the legislature, relative to the opening of new avenues of internal communication, the draining of marshes, &c. &c. and although it may possess but little to attract the general reader, it is interesting in the highest degree to the citizens of Maryland. The grand trigonometrical survey of the state has also occupied his attention, and details are exhibited showing its progress, under the advice of the chief of the United States Coast Survey, in connexion with which, this work is designed to be executed;—reciprocal benefits being anticipated from this mode of prosecuting the work. Several well executed lithographic maps accompany the report, illustrating particular portions of it. The concluding pages of the report recommending the establishment of a state observatory is particularly deserving of general perusal; the cause of science, and of public utility, would be promoted by a general attention to the following considerations presented in their remarks on that subject.

"After what has been said, the undersigned might terminate here his report, where it not that an object of great interest remains still to be submitted to your Excellency. This is a provision for the erection of a *State Observatory*. Although not indispensably necessary for the proper completion of the trigonometrical survey, it would furnish great and evident assistance, and would be found to increase in utility and value in proportion as the establishment itself grew older, long after the period when the labours of that survey shall have been closed. The fact of the importance of astronomical observations in one place, under the same circumstances, with assured regularity, and in a proper series, need not be adverted to here. The first advances towards civilization and the sciences were in the rude attempts to collect and classify knowledge in this particular—their latest acmé will be illustrated by the efforts and success in its pursuit. Already, in Europe, the *moral force* of a government is estimated by what is done under its auspices to enlarge the sphere of acquaintance with facts: and if for us the prosperity of the present is no inducement, a pledge of the gratitude of the future is found in the affectionate reverence with which the memory of those especially, who in this branch toiled, under greater disadvantages, for the promotion of the very object here recommended.

The Undersigned solicits, then, the particular attention of your Excellency and of the General Assembly, to this proposition. He asks for it no more aid, of course, than its intrinsic worth seems to deserve: but it appears to him that, to every one who will take the trouble to make the comparison, the contrast between the amount expended and benefits gained will be very striking. Not many hundred dollars would be required to arrange the necessary apparatus, with the conveniences, for its earliest trials. The fruits

of ten years' labour in that observatory would *sell* (if it is to keep a profit and loss account,) for five times so much—at the same time that it is exercising a moral influence incalculably more valuable.

The fact, that in this country there has been as yet no establishment of this kind, and that extensively indebted as our commerce is to the laborious investigations and observations of citizens and governments abroad, no effort has yet been made towards repayment, appears to offer strong grounds for the measure; and the present crisis seems not unfavourable for its execution. It may be added, that by no member of our national confederacy can the step be with more propriety taken than by Maryland; who has already, within late years, done so much by a discreet liberality to foster not only the researches of pure science, but that happier union of science and enterprize, which alone will render the one valuable—the other not unavailing."

A better index to what has been done by the geologist during the same period cannot, perhaps be furnished than by inserting the following extract from the report itself.

"It will be remembered that the final intention of the survey is, to furnish to the officer now engaged in preparing a topographical and geographical map of the state, on the accomplishment of his work, with a complete and minute geological account of the whole state, which will enable him to indicate upon the new map the localities of valuable mineral deposites, as well as to exhibit correctly, the limits of the different geological formations, that compose the territory of Maryland. Accordingly, the undersigned has never lost sight of this final object of his investigations, so that it has been his constant care to collect as much information in this respect as possible: and he flatters himself that he has succeeded in acquiring all the knowledge desirable, of such portions of the state as have been already traversed, and over which geological surveys have been completed. But it cannot be expected of him to make those results fully known at present, because there remains another important step to be taken, namely: to connect the results of observations made in one section of the country, with those in another; by which many generalities of consequence may be extended, corrected, improved, or modified. It is not necessary to be conversant with the subject, to perceive the necessity of becoming well acquainted with every part of a system of formations, before any comprehensive description of such a system can be given. Nor has it been in the power of the geologist, to adopt and pursue such a plan of operations more in accordance than the one he has followed, with this apparently most desirable mode of proceeding; his instructions having been virtually, to cause the strict demands of science to yield to the paramount considerations of public favour and utility. Hence it has not unfrequently happened, that whilst pursuing with great personal interest, a series of observations, a sense of public duty, and a desire to render more immediately available some important suggestion, have compelled him to obey calls upon him to set on foot new inquiries in other districts. Thus, whilst endeavouring to determine the exact limits of the three tertiary periods that occur within our territory, and partly extend over both shores of the Chesapeake bay, having received specimens of a valuable material, forming part of the secondary formations, it was deemed advisable to repair to this new field of interest, to expedite the benefit that might be derived from the discovery: some advantage being moreover expected, by directing the researches of those interested in it, preparatory to the future more minute investigations."

The report appears fully to establish the existence of green land of the age of the New Jersey marl, in Kent and Cecil counties, and intimates that some of the members of the same formation have been discovered in the Potomac counties.

In the belief that the legislature which ordered the survey designed it as the means for developing all the advantages and riches of the state for the benefit of every portion of her population, the geologist in prosecuting his labours, has endeavoured to embrace in his report every prominent consideration of practical utility immediately or remotely applicable, to the various interests of his fellow citizens.

In accordance with this understanding of his duties, he has laboured and it would seem successfully, in demonstrating to the agriculturists of Maryland, that they have within their reach the means of fertilizing and improving their soil to any desirable extent. Shell marl, green sand, oyster shell lime, are all readily attainable in their respective localities, whilst the unusual facilities of transportation afforded by the Chesapeake Bay and its numerous tributaries and inlets, afford to the farmers of both its shores, advantages, which are seldom equalled, and probably nowhere surpassed.

The cultivators of the soil are, it is said, already beginning to avail themselves of what has been pointed out in the former reports, and, if so, their practical experience will soon corroborate the scientific intelligence, which pointed out to them the sources of abundance and wealth so directly at their command.

One whole chapter of the report is occupied with considerations upon the agricultural resources of the lower counties, which is too voluminous for insertion in your pages; I therefore extract the following very interesting summary of them, intended by the author to direct the attention of his fellow citizens to the greater advantages which present themselves in their own fair territory, than may be found in the "far west" whither the restless spirit of emigration is fast hurrying a great amount of the population.

"Such are the agricultural resources of the lower counties on the eastern shore of Maryland, so far as the productiveness of the soil, and its susceptibility of improvement are concerned. It has already been stated, that the only incidental resource possessed by this section of country, is to be derived from the facilities of obtaining calcareous matter (in which the soil is essentially deficient) from the shell banks, oyster banks, and other sources already referred to. But before any hope can be indulged, that the inhabitants of this portion of the state will avail themselves of these means of bringing their lands into a higher state of cultivation than they seem to have any idea that they are capable of, it is necessary to remove a fatal impression, too generally made, that the lime derived from shells is of but little value. The result of the inquiries made to disprove this opinion, will be given in the next section of this report.

An error equally fatal prevails among the citizens of Maryland, in reference to the counties that have just been passed in review,—that they are as devoid of interest as they have been believed to be of resources. It is hoped that the minute, and, at the same time, faithful account given of them—more minute than would otherwise have seemed necessary—will have a tendency to rectify the false judgment so commonly passed upon this portion of our territory, and contribute likewise to cheer those of its inhabitants who have become disheartened at the present aspect of things, and who are too prone to believe that their industry could be better rewarded at a distance."

The immense heaps of oyster shells, furnishing vast supplies of lime, has induced Prof. Ducatel to devote an entire chapter, to a comparison of the value of shell and stone lime—an opinion prevalent among Maryland farmers that the former was inferior, for agricultural purposes, to the latter, is satisfactorily refuted. The analysis of the respective kinds of lime, showed a decided advantage in the employment of *equal weights* of lime obtained from calcined shells, over that obtained from limestone.

The annexed extract furnishes a general summary of the comparison; it is preceded by a particular account of the analysis of ten specimens of limestone, from Baltimore, Harford, and Frederick counties.

"It will be perceived that three out of the ten are magnesian limestones; all of them contain more silica or sand than has been found in oyster shells, and one, said to be most extensively used in Harford county, contains as much as eleven per cent. of inert matter. It follows, therefore, that, as oyster shells are composed nearly of pure carbonate of lime, they will afford a lime containing scarcely an appreciable quantity of impurities. If well burnt, (which is the case when no effervescence is observed on treating them with a weak acid,) lime obtained from them may be deemed, with a fractional difference, equal, weight for weight, to the best stone lime; and as their chemical composition does not vary, there is nothing to be deducted from the value of the product in consequence of the impurities that exist, as exhibited by the foregoing table, in most limestones, and that must necessarily form a part of the residue when *these* are burnt.

If the comparative value of the two products be estimated by measure, a greater difference is discovered; but there is at the same time a disproportionate difference in price. A bushel of the best alum-lime weighs from ninety to a hundred pounds; whereas, the same bulk of shell lime, unground, weighs from sixty-five to seventy-five pounds, and perhaps when ground would weigh eighty pounds,—a difference of from twenty to twenty-five per cent. But the former costs from thirty to thirty-five cents at Baltimore, the most convenient spot for its delivery on tide-water, where the latter can be had for ten cents; whilst farmers, conveniently situated on the bay side, might themselves burn the shells at an expence not exceeding six cents a bushel. These remarks refer to the lime obtained from recent or fresh oyster shells; but there is little or no difference between it and that procured by the burning of those contained in the Indian shell banks, provided proper care be taken to separate them from the black mould and dirt with which they are mixed.

It has been supposed, that because alum-lime has been found to admit of a greater admixture of sand than shell lime, in the making of mortar, it was to be inferred that it is correspondingly better, or, as it is termed, *stronger* for agricultural purposes. But this is an unwarrantable conclusion; for, as this circumstance seems to depend upon the peculiar aggregation among the particles of the lime, which prevents it from *setting* too rapidly, (or, in other words, attracting water and carbonic acid from the atmosphere sooner than the wants of the mason require,) it would appear, on the contrary, that, if any inference is to be drawn from it, it is adverse to the conclusion; whilst, on the other hand, the fact that shell lime *sets very quickly* is favourable to the opinion, entertained by some persons, of its superior efficacy in agriculture,—it being generally understood that lime acts in the soil in the condition of carbonate of lime. Admitting, however, that the peculiar arrangement of the particles in stone lime which renders it in general coarser than the lime obtained from shells, may better fit it as a mechanical amendment

to certain soils, the difference is at most as one to three, according to the datum upon which its superiority is predicated; namely, that in the preparation of mortar, stone lime will bear three times as much sand as shell lime. But even in this respect the conclusion is not warranted, except perhaps in the case of a purely sandy soil, in which lime *alone* would, it is believed, prove of little service."

The discovery of green sand, forms an important epoch in the agricultural history of the state, on account of its value as a manure; and a considerable space is devoted to its consideration. The author combats the opinion expressed in the Farmer's Register, that the fertilizing properties of this marl, are due to the sulphate of lime which it contains, and attributes them, with much reason, to the potassa found by analysis to exist in it, adapting thus, the conclusion of Prof. H. D. Rogers, in regard to the Jersey green sand. The geologists account of this interesting formation,, as well as that of the *micacrous black sand* associated with it, will well reward a careful perusal.

The greater portion of the report is occupied with an examination of the three lower counties of the eastern shore of Maryland, but there is a chapter containing a "Geological examination of St. Mary's county, in reference to its agricultural resources"—and a number of localities of shell marl or fossiliferous deposites are pointed out which may be made available. The gypseous clay mentioned in the first report, is also alluded to as doubtlessly affording a valuable agricultural resource. In addition to the marl, St. Mary's county also possesses the Indian shell banks, already referred to as existing in the Eastern Shore counties.

Under the title "Progress of the Geological survey of the State" the geologist, gives a detailed account of the extent of country visited by him during his tour of duty. Twelve of the nineteen counties of the state have been visited, and six of them, it is said, thoroughly examined so far as the purposes of the survey appear to require.

It is believed that this brief sketch of the contents of the report, will suffice to justify the assertion made at the commencement of this notice, that the industry, skill, and scientific attainments of the gentlemen employed by the state of Maryland, are such as eminently qualify them to execute the task which they have undertaken. And should the citizens of that state duly appreciate and employ the resources at their command, prosperity and wealth will abound in situations where the soil has been hitherto deemed as of but little value; the same rich treasures being within their reach which were so long unknown in the state of New Jersey, and which, since their value has been known, has caused the wilderness to blossom as the rose.

It appears from information which may be relied on, that the able manner in which Prof. Ducatel has discharged his duty, and the judicious construction which he has placed upon the intentions of the legislature, have already much more than repaid the expenses which have or will attend the examination. Lands have risen in value, new products are beginning to be obtained from the soil, and instead of exhausting its fertility by continued cultivation, without the attempt at renewing it, the means pointed out have been resorted to, by which it may regain its original vigour, and even the "old fields" again become laden with harvests. From present indications, it appears almost certain that the splendid schemes of Internal Improvements, now projected by the state of Maryland, will be carried into operation at a very early day, thus affording the means of communication throughout the larger portion of her territorry. The fruits of the husbandman's labour, and

the mineral treasures from the mine, with which she appears to be liberally supplied, will thus find a ready market. And we may fairly hope that when the blessings which must result from such improvements are fully experienced, it will not be forgotten that a large debt of gratitude will be due to those branches of science, without whose aid the hidden treasure would never have been brought into view; and that a flourishing community will, in its turn, contribute liberally to their further advancement.

A Friend to Internal Improvement.

Note by the Editor.—We had read with much pleasure the Report which forms the subject of the foregoing notice, and had marked for abstract and insertion in the Journal, most of the passages quoted by our correspondent, which we should have accompanied with such remarks as might have appeared to us pertinent; we, however, have preferred to avail ourselves of the labours of others, which, we believe, will also be equally acceptable to our readers.

Note on the occurrence of Bituminous Coal near the city of Havana, in Cuba; by R. C. Taylor, *Mining Engineer.*

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen:—I observe with much interest the notice of your correspondent, in the last number of the Journal of the Franklin Institute (p. 375) of a plan for extensively working the beds of bituminous coal in Illinois. There is little doubt but that an abundant supply of coal, of the quality he describes, will be of great public utility in the South,—will supersede, for many purposes, the employment of other fuel;—and will have a widely extended market, even down to New Orleans, to the great private advantage also, I trust, of those who are preparing to put this undertaking in execution.

I do not think, however, that the Illinois coal will form a large article of export, to the Havana for instance, as your correspondent suggests. *The existence of extensive veins of coal within the tropics is now established.* Probably it is not yet generally known, that there have been recent discoveries of coal, of very extraordinary quality, at at least two points on the coast of Cuba, near the Havana. One of these is only three leagues from that city, and two miles from the sea at a place of embarkation. This mine has very recently been investigated by Mr. Clemson and myself, and forms the subject of a joint report to the proprietors, on the quality, quantity, and mode of working it efficiently.

I do not enter into a description of this singular coal, because we are preparing a separate communication for a scientific institution.

It is extremely probable that this coal, which contains so remarkable a proportion of bitumen, will be exported from the Havana to most of the ports on the southern extremity of this continent.

I may add that coal occurs near the north-east end of Jamaica. Mr. De la Beche informs me, however, that these coal seams are very thin, and that none of sufficient magnitude to render them worth working have been discovered.

I am, gentlemen, respectfully,

Philadelphia, July 13, 1836. Richard C. Taylor.

Franklin Institute.

Committee on Science and the Arts.

Report on Messrs. Garrett and Eastwich's Locomotive Steam Engines.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination, the Locomotive Engines made by Messrs. Garrett and Eastwick, REPORT:—

That they have examined one of these engines now in progress of construction, at the shop of Messrs. Garrett and Eastwick, and witnessed the performance of another which has been completed and placed on the Philadelphia and Trenton Rail Road for trial.

They are constructed upon the principle of outside connections, the general arrangement being similar to that adopted by Mr. M. W. Baldwin, with some modifications, however, of sufficient importance to give them a distinct and original character. The most striking peculiarity is in the manner of reversing. This operation is performed in the different engines heretofore in use, by various contrivances, all of which involve the necessity of ungearing the connection of the eccentric rods with the rock shafts: consequently their action depends upon the contingency of throwing these parts again into gear, which can be effected only at particular points in the revolution of the eccentrics.

In the engines under consideration, the reversing is performed by means of movable valve seats, which are placed between the slides and the true seats, and connected with hand levers by rods passing through stuffing boxes in the steam chest.

In each movable seat are five passages, four of which are steam ways and one for the exhaust; two of the steam ways and the exhaust opening pass directly through the seat, the other two steam ways pass only about one-third through, and communicate with chambers which form oblique passages from one end of the seat to the other, so that the steam which enters the upper opening at one end of the seat, escapes by the lower opening at the opposite end.

When the movable seat is so adjusted that the direct passages coincide with the openings in the true seat, the action of the valve is similar to the common short slide: but if the seat be shifted, so that the communication shall be through the oblique passages, the course of the steam to the cylinder will be reversed without any change in the motion of the slide. This arrangement possesses the merit of simplicity in a high degree, and as its action does not depend upon any contingency, the engine can be reversed with certainty and precision. A small loss of steam results from the increased thickness of the valve seat, but it is believed the amount will not be sufficient to produce any appreciable effect upon the power of the engine. It has been suggested that the inequality of wear to which the movable seat will be subjected in its different positions, must render its surface irregular, and impair the tightness of the valve; some inconvenience may arise from this source, the extent of which can be determined only by experience; it is not apprehended, however, that the evil will be of a serious nature.

The situation of the cylinders and driving wheels in engines, with out side connections, allows a leverage to the working strain which very much increases the wear between the driving axles and their boxes, and also

twists the frame out of its proper form. Messrs. Garrett and Eastwick have endeavored to guard against the injury resulting from this cause by some slight changes in the parts most exposed to its effects.

Instead of turning down the bearings of the driving axle to obtain a shoulder for preventing lateral motion in the axle, they leave the axle its full size throughout, and provide against lateral motion by facing the hubs of the wheels, so as to form shoulders which bear against the outer ends of the boxes. The increased extent of bearing surface which is thus obtained both within the boxes and at their ends, enables them to resist more effectually, the thrust of the engine and adds to their durability.

The firmness of the whole machine has been increased by bracing the cylinders to the fire box, and bolting to the under side of the frame a strong plate of iron, which passes entirely around it and is secured to the pull bar.

The Committee have been informed that the engine which is upon the Trenton Road, has given entire satisfaction during a trial of several weeks constant service; the exhibition of its performance witnessed by them was highly gratifying, and they feel themselves warranted in saying that these engines afford evidence of ability to manufacture locomotives equal to any in the country for excellence of workmanship and general finish.

By order of the committee.

July 14, 1836. WILLIAM HAMILTON, *Actuary.*

Report on Mr. Prutzman's Lever Lock and Key.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination, the Lever Lock and Key, invented by Mr. Prutzman of Philadelphia, REPORT:—

That they have examined the lock and key and find it to be a specimen of both *ingenuity and workmanship.*

The main feature in the lock is the manner of securing the bolt, so as to prevent its being operated on by means of a *pick*, and to prevent a key being fitted to it unless in detached parts. The lock is arranged with tumblers working vertically, and horizontally, so as to secure the bolt in its position, when locked or unlocked. The tumblers are operated on by means of a lever inserted in the bit of the key, and working on a centre. This lever is put in motion by a plate so arranged in the lock, as to pass into one of the wards of the key, and press the lever towards the barrel or stem. One end of this lever acts on a projection raised on one of the tumblers, causing it to descend, whilst a portion of the key acts on a parallel tumbler, causing it to ascend, the opposite end of the lever acts on a horizontal tumbler, and thereby relieves the bolt. When the bolt is shut the tumblers resume their former position and secure it in its place. A lever is placed between the two parallel tumblers and working on a centre, the bolt is secured at one end and moved by means of a key at the other causing the bolt to move in an opposite direction to that of the key.

The general arrangement of the lock is simple and good, and we may add the best that is within the knowledge of the Committee. From the common key an impression may be taken so as to form a duplicate, but from the present arrangement of a key, with a lever inserted. it will not be practicable, owing to the great accuracy required in the formation of the lever.

Mr. Prutzman deserves a great deal of credit for his *ingenuity.* The

Committee understand that several of the locks are at present in use; one in the banking house of the U. S. Bank, and others in the city of Baltimore. The Committee recommend it to the public, particularly to Bank directors.

By order of the committee.

May 12, 1836. WILLIAM HAMILTON, *Actuary.*

Report on Mr. Raub's Steam Gauge.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination, Mr. Raub's Steam Gauge, REPORT:—

That Mr. Raub's Steam Gauge consists of a safety valve or piston, differing in no essential feature from ordinary safety valves, except that there is connected with it, by means of a lever, a weight, suspended in the water of the boiler, in such manner that when the water gets below a certain point, at which the weight is placed, the increased power of the weight, arising from its losing the support of the water, assists in opening the safety valve.

The practical effect is this:—If the safety valve is so graduated that steam will be blown off at a certain pressure, say seventy-five pounds to the inch, when the boiler is properly filled with water, it will escape at a lower pressure, say fifty or sixty pounds to the inch, according to the dimensions of the weight, when the water is too low. In this way it is proposed to avoid the explosions, or other evil effects which might arise from a portion of the boiler becoming bare of water and heated to a high degree.

The principle on which the weight acts, is like that of the floats which have been heretofore used, to show the height of water in the boiler, except that the weight in Mr. Raub's machine is connected with the ordinary safety valve, and the steam is blown off in large quantities when the water is too low, instead of a simple alarm being sounded.

The question for the consideration of the Committee is whether this combination, is advantageous. It is a matter of doubt, whether the blowing off of a quantity of steam when the water is deficient in the boiler, is not pernicious, as tending still more to exhaust the water; and whether the old application of the float to regulate the supply of water is not better. Waving these questions, however, it appears evident to the Committee that if a weight or float is to be used to cause the escape of steam, when the water is too low, it is better to have it attached to a separate valve, instead of being connected with the ordinary safety valve; because on the latter plan it will not operate when the steam is at a low density or pressure, although the water be deficient; and because when it does operate, the engineer cannot know whether its action is in consequence of the water being too low, or the steam too high. Hence the advantages usually anticipated from the use of floats, cannot be realized from this machine.

Whether floats or weights can safely be relied on for showing the low state of the water in the boiler, and for obviating its effects, is a question of experience which it is unnecessary here to discuss, inasmuch as Mr. Raub does not claim to have originated them, but to have made an improvement in their application: and for the reasons above stated, the Committee are not satisfied that his steam gauge, in its present form, will be found practically advantageous.

By order of the committee.

May 12, 1836. WILLIAM HAMILTON, *Actuary.*

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN FEBRUARY, 1836.

With Remarks and Exemplifications by the Editor.

1. For a *Machine for peeling Apples and Peaches;* J. W. Hatcher, Bedford county, Virginia, February 3.

This, we believe, is the sixth peeling machine that has been patented, and we do not think it any improvement upon the first, which was that of Moses Coates, obtained in 1803. The one before us, has a spindle, with a fork to receive the apple, a second spindle with an endless screw, a cog wheel, pinion, whirl and band, and other appendages for moving the knife; the apparatus for moving the knife is the only part claimed.

2. For a *Cooking Stove;* J. R. Cochran, Francestown, Hillsborough county, New Hampshire, February 3.

There is nothing in this stove worthy of special notice, its virtues depending upon the particular arrangement of the passages for heated air, and the dampers or valves. The claims are to "the form and construction of the apertures for the passage of the fire, and the dampers for closing either of them, or the passage under the oven, and the division of the passages for fire, by partitions, whereby the whole volume of fire is thrown on one side of the stove, and a greater heat thus produced on that side, and various degrees are produced in different parts of the stove at the same time, suitable for the different processes of cooking, and with less fuel than in any other stove of equal dimensions." As one object professed to be attained in a new cooking stove is, in nearly every case, to save fuel, we shall, by the time we have another five hundred stoves patented, not only save the whole, but have some to spare, should each of them save a little upwards of one five hundredth part only.

3. For an improvement in the art of *Manufacturing Rope and Cordage;* William Fanning, city of New York, February 3. (See specification.)

4. For a *Cooking Stove;* Daniel Williams, Scaghticoke, Rensselear county, New York, February 3.

This stove resembles, in form, a number of other cast-iron cooking stoves, having a body nearly rectangular, a fire place furnished with folding doors, an oven similarly furnished above it, and openings towards the back of the top plate, for cooking utensils. Its claim to novelty consists in making the fire place a sliding drawer, which can be brought forward upon the bottom plate; this drawer has a grate upon which the fuel is sustained, and a top plate, perforated for cooking utensils. When pushed in, there is, necessarily, a double plate between the fire and the interior of the oven.

The claims are to the movable, sliding fire place, the manner of connecting it with the other parts of the stove, and particularly to the obtain-

ing by its means, a double bottom to the oven, and thereby regulating the intensity of the heat; the provisions for carrying off the steam, &c.

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5. For an improvement in the *Cultivator;* James W. Garnet, Loretto, Essex county, Virginia, February 3.

This is called an improvement on the X, or Echelon Cultivator. "It consists of a curved cast-iron, marked No. 3, having in the under side two dovetail grooves, which the wrought iron marked No. 4, [shown in the drawing] is made to fit, so that when one point is worn out the other may be turned. Four of these are fixed in a bar of wood diagonally, at an angle of 45°, to a straight beam of the length and size of a common plough beam for a single horse."

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6. For a *Machine for Shelling Corn;* Isaac A. Hedges, Elmira, Tioga county, New York, February 3.

This machine, in its general principles, resembles the first shelling machine which was patented. It has a revolving cylinder and a concave, between which the ears of corn are to be shelled. The cylinder is to be formed of cast-iron staves, having teeth upon it, and the concave is also of cast-iron staves, with spaces between them for the escape of the grains of corn; the concave is borne up by springs. The ears are to be put into a hopper above the cylinder, and to be conducted through a proper aperture to the shelling part. The claim is to "the concave cylindrical surface by a combination of staves, with springs attached as herein described; and the application of such surface so formed to the purposes of corn shelling; as also the application of such surface to a cylinder for the same purpose."

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7. For an *Oven to be used over the common Fire Place;* Samuel Pollard, Orono, Penobscot county, Maine, February 3.

This patent is taken for an improvement upon the oven patented by the same person in June, 1835, and noticed at page 46, vol. XVII. The sheet-iron oven is placed, as before, across the chimney, above its throat, and in addition to the flue leading to it, about level with the surface of the fire, there is a second flue near the throat of the chimney, which is closed by a door. A grate is fixed in the flue to sustain fuel, that a fire may be lighted there when there is none in the fire place. The claim is to "the introduction of the second described flue, damper, and grate; the outside cylinder and the damper above, or on the top of it, these being the additions now made, as improvements." The second cylinder forms the flue around the oven, and is like that in common use in similar ovens set in jambs.

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8. For an improvement in *Saw Mills;* George W. Black, Montgomery county, Tennessee, February 3.

The object in constructing this mill is to apply the power above the surface of the ground. The main cog wheel, driven by any suitable power, gears into a pinion on a pitman shaft above the sills, the pitman extending thence to a rocking shaft which gives motion to the saw frame, hung in the usual way. The claim is to the horizontal pitman and its appurtenances, including "the entire mode of driving the saw, or saws, and the mode of applying the power to them," in which the patentee perceives numerous

advantages, which we apprehend will not be realized in many situations, and no where, assuredly, where water power is employed.

9. For a *Straw Cutter;* Isaac S. Wright, Elbridge, Onondaga county, New York, February 3. (See specification.)

10. For a *Machine for Harvesting, Thrashing, and Cleaning Grain;* Eliakim Briggs and George W. Carpenter, Covington, Franklin county, New York, February 5.

This machine is to run on four wheels, like wagon wheels, the adhesion of the hind wheels to the ground carrying revolving scythes, a cylinder thrashing machine, and other appurtenances. The apparatus is not fully described, and we are very apprehensive that it had not been fairly tried before being patented, as we are of opinion that its promise upon paper would not be realized in the wheat field. Its power to cut, convey, thrash, and clean grain, and the satisfactory concurrent action of all its parts, would not, we think, have given it a passport to the Patent Office.

The claim is to "the manner and principles of applying the power of a team to cutting, thrashing, and cleaning grain, by moving forward the machine; of cutting grain, of carrying it to the thrasher, of thrashing, and of cleaning grain, by power so applied." This claim does not, with sufficient distinctness, state the particular machinery for effecting the object, refers to no individual part of it, but appears to relate more to the end than to the means, whilst the latter is the only thing patentable.

11. For an improved *Saddle Tree;* Andrew R. McBride, Williamson county, Tennessee, February 5.

This saddle tree is to be made of four pieces of wood only. The crotch or front piece is to be formed from the natural growth of the timber. The cantle is also to be a single piece, and these are to be connected by the two side pieces. Whether the crotch is to be made from a crotch, or how the natural growth is to be obtained, we do not learn, nor are the directions given, in general, specific in their character; the claim is entirely omitted, and we are left, therefore, to infer, for ourselves, what it is intended to patent.

12. For a *Horse Rake for Hay and Grain;* Joseph W. Webb, Mount Morris, Livingston county, New York, February 5.

Behind an axletree with two wheels, there is a frame which sustains the rake-frame, and the latter slides up and down between cheeks, furnished with grooves for that purpose; upon the bottom edge of the rake-frame are teeth, curved forward and reaching to the ground; a man stationed on a platform above the axle tree, raises the rake-frame by means of a lever, when it has collected the desired quantity, and thus deposites it. The points of the rake teeth curve back suddenly to prevent their catching in the ground, The claim is to "the manner of raising or depressing the rake at pleasure, by means of the perpendicular grooves and the lever; and the manner of curving the teeth backwards, for the purpose set forth."

13. For a *Machine for cleaning smut from Buckwheat and Rice;* Samuel Richardson, Elmira, Tioga county, New York, February 5.

It is very well that the patentee sets forth no exclusive claim to this ma-

chine, as, were he to do so, he would encounter a host of competitors. The whole consists of a hollow cast-iron cone, in which runs a conical nut, both properly grooved, in the well known old coffee mill fashion.

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14. For a *Press for Cotton, Tobacco, &c.;* Azel M. McLean, Russelville, Logan county, Kentucky, February 5.

This press consists of a lever working on a fulcrum between two upright posts, the articles to be pressed being placed under the lever, and resting on sills, or a platform on the ground. A rack and pinion below the long end of the lever serves to raise or lower it; and the improvement claimed consists in extending the lever beyond the uprights, so that it shall have a short arm projecting out far enough to press the articles by the elevation of the long arm, as they are pressed on the opposite side by its depression.

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15. For a *Horse Power;* Dudley Marvin, Canandaigua, Ontario county, New York, February 5.

This machine is, in its general construction, like many which have preceded it, consisting of an endless chain floor upon which the animal walks, which floor is sustained by friction rollers running upon ways, and connected so as to form endless chains; it is the peculiar manner in which these are put together, upon which the patentee must depend to sustain a claim, and he says, "I confine my claim to the particular manner in which I construct the power chain, and the friction chain, as described, together with their combination with those accessary parts which are necessary to their action. I do not claim either of the individual parts as separate and uncombined."

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16. For a *Churn;* Hezekiah Roberts, Seneca Falls, Seneca county, New York, February 5.

A vertical churn is to have the dasher made to revolve alternately in reversed directions, by means of a double strap, the two ends of which are wound round the shaft, and are alternately acted upon. To produce this motion, the patentee employs a wheel and pinion, on the shaft of the latter of which there is a crank and fly wheel. A pitman from the crank is made to vibrate a wheel which communicates the alternating revolution by means of the straps. The claim is to "the crank, connecting rod, spur wheel, pinion, and balance wheel." All of which are well known affairs.

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17. For an improvement in the *Process of preparing bark and obtaining the extract therefrom;* Daniel Williams, Boston, Massachusetts, February 5.

We are informed that the bark is to be first divested of its outer part, after which the inner bark is to be cut into small pieces, and the tanning principle extracted therefrom by boiling, or by steam; the water is then evaporated and the extract fit for use. The thing claimed is the extracting tannin from the inner bark cut into pieces, instead of grinding or pulverizing it, by which means, it is said, the extract is more pure, being free from the admixture of the minute particles which remain in it when procured from the ground material.

How many thousand times the chemist has thus obtained the extract of bark in his laboratory, we cannot tell, but certainly more frequently than from the pulverized material.

18. For an improvement in the *Cotton Saw Gin;* William and James M'Creight, Winnsborough, Fairfield district, South Carolina, February 5.

The gin retains its usual form, but the patentees claim, "First, a movable breast; second, sliding ribs, and third, the centres of the brush, and the pivots on which they turn," which improvements, they say, render the apparatus more durable, and more easily kept in order.

"The breast is hung to the front of the gin with two hinges, and can always be raised so as to get at the saws," when they require any attention. The sliding ribs are so called, because they are made so as to shift, or slide, and expose new portions of them to the action of the seed, so that they may be shifted endwise four or five times, before they require to be renewed; they are confined at their ends by screwed cleats, which are loosened when the ribs are to be shifted. The pivots of the brush are made of square cast-steel, pointed at each end, and fixed in a manner which allows of their being shifted readily when one end is worn.

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19. For an improvement upon a *Grist Mill;* William and James M'Creight, Winnsborough, Fairfield district, South Carolina, February 5.

This is said to be an improvement upon the grist mill, patented by Ed. Newman, in February, 1827.

The improvement consists in the lengthening of the spindle to twice the original amount, and in the mode of fixing and regulating the hard wood bushes which bear against it. We do not think it necessary to particularize the mode of fixing the hard wood for this purpose, but will merely say that the bush consists of four pieces, standing endwise against the spindle, confined in their places, and regulated in their bearing, by means of screws.

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20. For an improvement in *Locomotive Steam Engines;* Henry R. Campbell, Northern Liberties, Philadelphia county, Pennsylvania, February 5.

"My improvement consists in the combination and application to each locomotive steam engine, of two pair of driving or propelling wheels, and two pair of guide wheels. I also claim as a modification, and as a part of my improvement, the combination and application to each locomotive steam engine, of two pairs of driving or propelling wheels, and one pair of guide wheels. What I denominate *guide wheels*, are those which carry a portion of the weight of the engine and conduct it along the rail road, without direct connexion with the driving wheels."

The objects in view are to increase the weight and power of the engine; to extend its bearing and weight over a larger portion of the road; to increase the adhesion by doubling the number of driving wheels; "to increase the facility of turning curves by compounding the leverage of the engine upon the flanches of the wheels against the edges of the rails;" to reduce the wear and tear, and consequently the expense of transportation on rail-roads.

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21. For a *Bee Hive;* James W. Hubbard, Canterbury, Merrimac county, New Hampshire, February 5.

There is not any thing in the contrivance of this hive which appears to

merit particular notice, the thing claimed is a mere trifling matter of arrangement.

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22. For *Flasks for moulding hollow bulge Ware;* Lewis H. Maus, Danville, Columbia county, Pennsylvania, February 5.

At page 60 of the last volume, we published the specification of a patent obtained by David Stewart of Danville, under a title, and for a purpose, similar to the foregoing. We have not had time to compare the two plans with all that care which is necessary to enable us to point out their resemblances and differences, but our present impression is, that they are substantially the same. In the former case there is a distinct claim made, pointing out the particulars of the improvement, as may be seen by turning to the specification; in that before us, certain peculiarities in the plan pursued are spoken of, but there is not any formal claim, although one may probably be made out by construction. We shall probably publish Mr. Maus' specification hereafter.

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23. For a *Thrashing Machine;* Lewis H. Maus, Danville, Columbia county, Pennsylvania, February 5.

This is said to be an improvement on James Parson's thrashing machine. The cylinder and concave are to be of cast-iron, and the improvement appears to consist in the casting it in parts more light and convenient than the original machine; there, however, is no specific claim, nor is there any thing in the operation of the machine, as now patented, to distinguish it from other cylinder and concave thrashing machines.

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24. For an improvement in the *Saw Mill Saw;* Benjamin K. Barber, Johnsburgh, Warren county, New York, February 5.

Two teeth in the middle of the saw are to be set in a winding position, and are to be ground "to an edge on the outside, so that the upper outer edge of the teeth shall be sharp, and stand out on each side of the saw more than even with the outside edge of the points of the other teeth, when set about half as wide as is usual for common sawing." There is also to be a kind of tooth attached to the back of the saw, and set in a winding position, so as to cut up on one side and down on the other. We confess that we do not fully comprehend the description, nor do we see how teeth in the centre of a saw are to operate on stuff to be sawed which is wider than the double length of the crank; a kind of stuff not unfrequently cut. There is no claim, and we do not know that one is required, as the whole thing may be new.

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25. For a mode of *Equalizing the blood of the human system;* Solomon R. Terrell, Burton, Yazoo county, Mississippi, February 5.

The arm, leg, or whole body, is to be enclosed in a tube, or vessel, rendered air tight by India rubber, or other suitable substance, and the air is then to be extracted by means of an air pump, so as to take off atmospheric pressure from the part enclosed, and thereby cause an influx of blood; to promote which additional warmth is to be applied. This is the sum and substance of the patent. About thirty years ago a patent was obtained in England for a similar apparatus, and an agent came into this country to carry the plan into effect here. It was intended not only to exhaust the air as above proposed, but to admit steam or gases, to act upon the limb or

other part, enclosed. We repeatedly saw the instruments in Philadelphia, but after the lapse of three or four months heard no more of them.

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26. For an improvement in *Mortise and other Locks;* Philos and Eli W. Blake, New Haven, Connecticut, February 5.

This lock exhibits much ingenuity and skill in its construction, but the description and drawing would both be necessary to make the plan adequately known. There are eight specific claims, which if given alone, would not afford an idea of the structure; we must therefore pass it over, as requiring more space for illustration than can be afforded.

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27. For *Preventing the heating of Flour and Meal in Grinding;* Isaiah Pape, Windham, Cumberland county, Maine, February 5.

A strap of leather is to be buckled, or otherwise fastened, round, and near the lower edge of the upper stone or runner; and to this are attached fifteen, or any other preferred number of blocks, or pieces of iron, which hang loosely upon the edge of the bed stone; these are to prevent the flour accumulating between the stones and curb, and remove it, consequently, from the source of heat.

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28. For *Preventing malt liquors from becoming sour;* Josiah Stowell, Manchester, Hillsborough county, New Hampshire. (See specification.)

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29. For a *Crimping Form, for crimping boots;* William Gerrish, Poland, Cumberland county, Maine, February 10.

The form, with the screws and nuts by which the leather is to be drawn on to it, are fully described, but there is no claim made, or any attempt to discriminate between this and the numerous other contrivances for the same purpose.

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30. For an improvement in *Gun Locks;* Samuel Morrison, Milton, Northumberland county, Pennsylvania, February 10.

One object in this lock is to enable the gunner to fire off either one or two loads at the same time, or at separate times, from a single barrel. The first load is received in a chamber somewhat smaller than the general bore of the gun, and the charge is covered by its ball, after which the second load is rammed down; there must be two cups for percussion powder, or nipples for two caps, with a contrivance to prevent the discharge of the first charge, when one only is to be fired off. There are six separate claims to distinct parts of the lock and its appendages, which we do not think it necessary to give. It has been repeatedly proposed to place several charges in a single barrel, to be fired in succession, and the mode of effecting it has been described, but there, we believe, the matter has ended, and is likely again to end.

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31. For a *Twain Water Wheel;* William L. Elgar, Chester county, New Hampshire, February 10.

Here are to be two shafts each having buckets, or floats, at one end, and geared together at the other by cog wheels. The water is to be "applied at the centre, so as to exert its power on both," and the claim made is to

"the applying the two wheels together, thereby obtaining a much greater power from the same quantity of water."

We are not instructed in the manner of causing the water to act upon the floats in the centre only, and we really cannot tell how it is to be effected; the thing, however, is altogether unworthy of thought.

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32. For a machine for *Planing and Dressing Boards;* Melzer Twells, Milo, Yates county, New York, February 10.

A fare wheel is to revolve vertically, carrying four, or any other number of, plane irons, and close to the periphery are to be cutting bits, or hooks, to precede the double or single irons in their operation. The boards are to be held edgewise, resting against standards upon a suitable carriage, and held against the vertical standards by dogs. The plane wheel is to be driven by one band and whirl, and the carriage to be moved by another. This comprises all the information given, and there is not any claim. The plan has nothing in it having the remotest alliance to novelty, nor does it bear those features of maturity which would lead to the conclusion that it had been tried. The fact, is that as presented in the specification, it will not work well, and if it would, a patent could not be sustained for it.

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33. For a *Machine for Shelling Corn;* Henry G. Neale, Poultney, Rutland county, Vermont, February 10.

A rubbing board, furnished with teeth, or cased with a toothed cast-iron plate, is made to slide horizontally in grooves, by means of a handle, a second rubbing board being placed under it, and borne up towards it by steel or wooden springs attached to the frame. The claim is to the whole machine as constructed.

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34. For a *Machine for cutting Straw, Hay, &c. &c.;* Chauncy D. Skinner and Dana Reed, Haddam, Middlesex county, Connecticut, February 10.

The specification of this patent gives a verbose description of the dimensions of the different parts of the machine, and ends by claiming "the combination of the various parts as described." The material to be cut is placed in a trough in the usual way, and the knife is fixed upon the face of a wheel revolving vertically; the shaft of this wheel has a crank on it, and is to be driven by the aid of a treadle, in the manner of a foot lathe. There is no feeding apparatus, or any thing of moment not pointed out by us.

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35. For a *Churn;* Lyman Whittier, Vienna, Kennebec county, Maine, February 10.

A churn, in the ordinary form of the vertical kind, is so hung as to swing backwards and forwards like a pendulum, there being a suitable frame to sustain it. A vertical shaft passes through the top, and runs in a pivot at the bottom of the churn; wings, or dashers, being attached to it to agitate the cream. A small cog wheel, or pinion, surrounds the vertical shaft, above the lid of the churn, and the teeth of this wheel take into teeth on a piece of timber, forming a rack, and attached to the frame, which, when the churn is swung, causes the shaft to revolve; the swinging may be effected by means of a rod, or other contrivance, attached to it for that purpose. The claim is to the mode of producing motion by the action of the cogs.

36. For a *Machine for Cutting Straw;* Joseph Evered, an alien, who has resided two years in the United States, February 10.

The description of this machine refers to the drawing throughout, and ends with a claim to "the finger wheels; the rising and falling of the rollers; the compression produced by the lever and weight; the concavity of the knives edges; the plan of the face of the wheel through which the straw is drawn; the centre screw on the worm and spindle, and its rise." The general form of the machine is such as has been in use for more than half a century, the straw being contained in a trough, furnished with fluted feeding rollers, and the cutting effected by curved knives on the arms of a fly wheel, revolving at one end of the box; these curved knives, it will be seen, are claimed as new; if the inventor could go back as far as we can in the recollection of the use of curved knives, in a manner precisely the same with their employment in this machine, he would not place *himself* among the novelties of the day. There are other things claimed, which are in the same predicament, and where so many individual things are particularized, it is not easy to avoid such an error, as few persons are fully informed of what has previously been done in those cases where machines have been long employed, as in cutting straw.

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37. For a *Thrashing Machine;* Thomas Beede, Sandwich, Stafford county, New Hampshire, February 10.

This is a cylinder and concave machine, with some peculiarities about it upon which to found a claim, but not substantially different from numerous others of the same general construction.

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38. For a *Cooking Stove;* John J. Giraud, Baltimore, Maryland, February 5.

The main improvement spoken of in the specification of this stove, is a *box door*, which is to answer the purpose of the ordinary *Dutch oven*, but what are the peculiarities of its construction we cannot discover, as it is mentioned in the specification in the most general way. There is a drawing, with letters on the respective parts, but we find no references to them, and most of the things represented have no novelty whatever. The claim is to "the door oven at the front of the fire place, as well as the general combination and structure of the entire instrument." The *door oven*, which is specially claimed, is to be dispensed with when the stove is used for warming only.

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39. For an improved *Molasses Gate;* Charles W. Perkham, New Haven, Connecticut, February 10.

This gate is constructed like those in general use, but a spring is used to press the gate, or sliding plate, against the orifice of the instrument, and the employment of the spring, exclusively, is the subject of the claim.

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40. For an improvement in the *Flyer for twisting roping, and yarn of cotton, hemp, or flax;* Willard T. Eddy, Ithaca, Tompkins county, New York, February 10.

The claim made is to "the combination, arrangement, and adaptation of the several parts of the spindle and flyer for twisting roping; but particularly the mode of hanging the spindles on a joint, and securing it by a spring; also the spring bearing against the end of the spool." The par-

ticulars referred to cannot well be described without the aid of the drawing.

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41. For a *Slide Valve for Steam Engines;* Alexander M'Causland, Jr. City of Philadelphia, February 10.

This valve is constructed with a view to easy action, and facility of reversing the motion; the description refers throughout to the drawing; the claim is to "the opening through the valve, thus admitting the steam to act equally, and at once, upon the lid, or upper plate of the steam chest; and also the manner described of packing the top of the valve with metallic packing."

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42. For a *Crane for moving heavy bodies;* Elias Marsh, Oswego, Oswego county, New York, February 10.

In this crane the power is applied to a horizontal lever attached to a vertical shaft, in the manner of the common horse mill. At the upper end of this shaft there is a drum, round which the hoisting rope is to coil. The other end of the rope extends to the outer extremity of the arm of a common crane, and leads over pulleys in the ordinary way, to a block. Over the shaft of the crane there are two guide pulleys for the hoisting rope, keeping it in its place as the crane is turned in any direction. The drum at the upper end of the first named shaft, turns upon an iron gudgeon, and rests upon a coupling box, so that when the load has been raised, and the crane is turned to the point where it is to be dumped, by pulling on a lever the drum is disengaged from the coupling box, and the load descends. The claims are to "the arrangement by which the arm is left free to traverse whilst the force is operating, or by which the force applied is made to act and react in the direction of the arm, without the intervention of check ropes, windlasses, &c., attached to the boom, as in ordinary use." So far as this applies to the allowing the crane to turn freely whilst the hoisting rope is kept in its place by the guide pulleys, there is no novelty in the thing, and it seems to us as though this was mainly alluded to.

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43. For an improvement in *Piano Fortes;* John Pethick, City of New York, February 12.

The improvements claimed relate to the *action* of the instrument, and consist in "making the *breast*, and *lip*, or *notch* of the *hammer butt*, or *knuckle*, about double the thickness of those heretofore made; to wit, of the same breadth as the *hinge butt*, or a trifle less, to admit of its moving freely without chaffing each other;" to accomplish this, the shape of the hinge butt is altered, in a way described and shown in the drawings, and allowing "more than the usual width of the cloth, or other soft and suitable substance, for the centre pin to work on. In preserving the full breadth of the *Jack flyer*, or connecting lever, instead of passing it down to a breadth corresponding with that of the *hammer teeth*, as heretofore practised." These improvements are upon the French, or grand action, invented by Papp, of Paris.

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44. For *Constructing Boats to be used under water;* Edward P. Fitzpatrick, Mount Morris, Livingston county, New York, February 12.

These boats are to be constructed with a triangular cross section, one angle forming the lower point, or keel; the stem and stern are to be sloped

from the lower angle to the upper side, but they are to be, otherwise, perfectly straight. These boats are to be connected together, and to be entirely submersed; of course they must be air-tight. Pillars from them are to support a platform above the water, upon which the load is to be placed. Upon the lower side of this platform there are to be semi-cylindrical hollow trunks. "The intention of these semi-cylinders is to preserve the equilibrium of the platform, or receiving vessel, when in motion, and when the hollow triangular boats are sufficiently sunk." The propelling is to be effected by means of a paddle wheel, or of a spiral screw, placed between the boats. The claim is to "the form and construction, as being better suited to the purpose intended, of preventing the agitation of the surface in so great a degree as has been the case heretofore."

Those who have been in the habit of using Nicholson's Hydrometer, will not need to be told of the difficulty, we might say impossibility, of regulating the load of such a boat; but independently of this the whole plan is open to numerous valid objections, and proceeds upon the false assumption that the water may be agitated just below the surface, whilst it remains comparatively tranquil there.

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45. For a *Churn;* John E. Thomas, Winchester, Preble county, Ohio, February 12.

The body of the churn is to be a box, or case, through which two shafts are to run, furnished with slats, or dashers, passing between each other; on the outer end of each shaft there is to be a pinion, which is to be turned by a cog wheel; numerous examples of this churn exist in the patent office, and probably elsewhere.

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46. For a *Horse Power;* Joseph Austin, Franklin county, Vermont, February 12.

No claim is made by the patentee to the construction of this horse power and although such an omission is sometimes to be regretted, it, in the present instance, will not be productive of the slightest loss or inconvenience, a claim having been made thereto more than forty-one years ago, and a drawing and description of it having been given in the second volume of the Repertory of Arts, published in 1795. The plan is to obtain power by placing the animal near the top of a large, revolving drum.

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47. For a *Machine for Cleaning and Dressing Feathers;* Daniel K. Hall, City of New York, February 12.

Feather dressing machines are now the order of the day, and have become so numerous as to prevent our looking after any thing new, in a new patent, excepting merely a change of form, whilst the principle of action is identical. We find no cause, in the example before us, to alter these views.

The feathers are to be put into a cylindrical screen which may be formed of wire, with solid ends. A shaft furnished with pins to agitate the feathers passes through, and may be made to revolve in, this screen. When charged with feathers it is to run upon ways into a chamber, or oven, in which it is to be enclosed by a door, admitting the shaft to pass through it. The heated air from a stove, and the vapour of water from a vessel placed upon it, aided by the agitation of the feathers, effect the purpose intended. There is not any claim made.

48. For *Securing the Drop Doors of Rail Road Cars;* John K. Smith, Port Clinton, Schuylkill county, Pennsylvania, February 12.

This is not an affair which will interest many of our readers, nor one which could be intelligibly placed before them without the drawings; the claim being "to the various pieces which compose the fastening, and their general arrangement."

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49. For a *Steam Feather Dresser;* Samuel Keplinger, City of Baltimore, February 12.

The feathers are to be put into a cylinder, similar to that described at No. 87, provided with a shaft and agitators, also similar. A second cylinder is to surround the first, at a distance of two or three inches from it; and into this steam is to be admitted from a boiler. The claim is made to "the combination, arrangement, and adaptation of the several parts of the before described machine." A standing claim which fits equally on to every contrivance, be the same old or new; but to this is added "particularly the mode of heating the feathers *by steam*, in the manner described."

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50. For a *Washing Machine;* Luther Davison, Norwich, New London county, Connecticut, February 12.

A cylinder, the ends of which may be of wood, and the barrel part of zinc, is to revolve horizontally; round bars of wood are to reach from head to head, on its inside, standing at a small distance from its periphery, and allowing a space between each of them. A partition is also to extend across the middle of the cylinder, formed of similar bars, and dividing it into two equal parts. A door on the side of the cylinder allows the clothes to be put into either division of it.

"What I claim, is the arrangement of the bars in said cylinder, the partition of the cylinder, and the principle of washing the clothes in two separate parts of the same." A *principle*, the discovery of which will scarcely confer immortality.

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51. For *Apparatus for Drying Cotton after it has been picked, &c.;* John Philbrick, Wilkinson county, Mississippi, February 12. (See Specification.)

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52. For a *Blowpipe for Furnaces;* John Barker, City of Baltimore, February 12.

The patent for this blowpipe, is about to be re-issued under an amended specification, which we shall give at length.

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53. For a *Sliding Coal Grate;* John C. Howard, Howard's Valley, Windham county, Connecticut, February 13.

A cast-iron grate, upon which a fire may be made, is to run in and out upon ways, on the sides of a fire place. The description of the thing is very imperfect, but a claim is made to "the manner of constructing this grate and its appendages, so as to be passed in and out of the chimney back, fire frame, or stove." Sliding, or "rail way grates," are no novelties, there, however, may be some unperceived advantages in the plan intended to be described.

54. For a *Machine for Shelling Corn;* Ira Smith, Downingtown, Chester county, Pennsylvania, February 13.

This machine does its work by means of a vertical revolving plate, constructed in the well known way of making such plates. The supposed novelty will appear from the claim, which is to "putting teeth or projections on both sides of the wheel, instead of on one side, as in the common method, thereby shelling twice as fast." It so happens, however, that this contrivance is old, having been patented some years since, and subsequently re-invented more than once.

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55. For a *Machine for making Screws;* William Keone, Monroe, Orange county, New York.

This machine is for cutting the threads upon wood screws; it is contrived with considerable ingenuity, and possesses much originality; it appears likely to operate well, and should it do so, and make screws with sufficient speed, it will be of great value; from want of the latter property, several such machines, in other respects very perfect, have been abandoned. The dies in this machine consist of two cast-steel wheels, about an inch and a half in diameter, fixed so as to revolve on axes, with their edges nearly in contact; upon these edges the female screw is cut. They are so constructed as to be borne up towards each other, whilst the screw is being cut, and they, and the apparatus to which they are attached, are contained within a can, or vessel, filled with oil and water. A hollow vertical shaft passes through the bottom of the vessel, and through this shaft the requisite revolving motion is communicated. The contrivances to effect this, and the other requisite objects, are too complex for verbal description. The claim is "to the combination and arrangement of the several parts of the machine for making screws, particularly the mode of giving the dies a simultaneous horizontal and vertical movement in oil and water, whilst cutting the screw." We do not think the former part of this claim sufficiently guarded, as the combination and arrangement may be much varied, whilst the result will be the same, and the means substantially similar.

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56. For an improvement in the *Wheat Fan;* David Flanders and Calender Rathburn, Fort Covington, Franklin county, New York, February 13.

The general construction of this wheat fan is the same as those in common use, and although much pains have been taken to describe its individual parts, we are not told, and are unable to discover, in what its special utility and novelty consist.

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57. For a *Machine for Cutting Sausage Meat;* Ambrose Henkel, Shenandoah county, Virginia, February 13.

The general construction of this machine may be inferred from the claim to "a cylinder with knives; secondly, their cutting between bars of any kind; and thirdly, the general construction of the machine." This claim is much too broad, the two first items in it not being sustained by their novelty, and not, therefore, sustaining the third.

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58. For an improvement in *Hydraulic Docks;* Zebedee King, City of New York, February 13.

Those who are acquainted with the different plans which have been

devised for raising vessels out of the water for the purpose of repair, know that the principle of Bramah's press is applied to that purpose in the Hydraulic Dock, at New York, and probably elsewhere. The present patent is taken for improvements on the mode of constructing and using certain parts of that apparatus, which improvements are explained at large, and fully shown in the drawings, but cannot well be presented in a summary.

[TO BE CONTINUED.]

Specification of a patent for an improvement in the art of manufacturing Rope or Cordage. Granted to WILLIAM FANNING, *City of New York, February 3rd*, 1836.

To all to whom these presents shall come, be it known, that I, William Fanning, of the City of New York, in the county and State of New York, have invented a new and useful improvement on the art and manufacture of rope, or cordage, made from hemp, flax, cotton, manilla, cicol, or grass, and that the following is a full and exact description of the method of making the circumvolved rope.

What I claim as my own improvement, and not previously known, in the art and manufacture of rope, or cordage, is making the ready, or strand, of the rope, with as many true and separate spiral twists and turns, as there are circles of threads in the ready, or strand, when finished; which is done by first taking as many threads as are necessary to form the inner, or centre, circle of the ready, or strand, placing them through as many holes made circular on a plate; they are then fastened to a machine sufficient to give sufficient turn, and drawn through a tube of proper size, giving to threads and centre circle of ready, or stand, a spiral form in exact proportion to its size. The first circle formed is then put through the centre hole of the plate, and as many threads rove through the holes of the plate in a circular manner, as are necessary to form the second circle; the threads and centre circle first formed, is then fastened to a second machine, standing a proper distance from the first named, and drawn together through a second tube of proper size, the circle of threads last rove completely circumvoling the centre of first circle formed, giving to yarns and second circle a spiral form in exact proportion to size of circle formed, and every succeeding circle is rove through the plate, tubed, twisted, and formed in the same manner as the above described second circle, giving to each circle a spiral form in exact proportion to its size, and every circle of threads rove separately through the holes of the plate tubed and formed, giving a true spiral form to each, will be completely circumvolved by the succeeding circle and rendered impervious to water: the threads are reeled separately on bobbins, and placed in a frame, as usual, in making other ropes. The machine used in making the circumvolved, together with the rope, or band, applied to the same, is such as has been in common use for many years, to which I have no claim of invention or improvement.

WILLIAM FANNING.

Specification of a patent for an improved machine for Cutting Straw. Granted to ISAAC S. WRIGHT, *Elbridge, Onondaga county, New York, February 3rd*, 1836.

To all whom it may concern, be it known, that I, Isaac S. Wright, of

Elbridge, in the county of Onondaga, and the State of New York, have invented certain improvements in the construction of machines for cutting straw, and I do hereby declare that the following is a full and exact description thereof.

The straw to be cut is placed in a trough in the usual way, but the trough differs in form from those generally employed, being, most commonly, made out of two pieces of plank, joined together lengthwise, at right angles, or at any angle greater or less than a right angle, as may be preferred. This trough has a cutting knife at one end, which is fixed into a frame sliding up and down in grooves, like a mill saw frame. This knife consists of two cutting parts, united together at the middle, so as to form a right angle, or any angle greater or less than a right angle, as may be preferred. The angle of the trough points downwards, and the angle of the knife upwards, the cutting edge being downwards. The gate, or frame, which carries the knife, may be moved up and down by means of a lever, a treadle, a crank, or in any of the known ways of producing such a motion. The fore edge of the trough is armed with iron and steel for the knife to cut against. Both the knife and the trough, may, instead of being in the angular shape described, be made curvilinear, in which case it will be best to make the curve a segment of a small circle in the middle, corresponding with the angular point above mentioned. The object in view will, in either case, be equally well attained; this object being so to form the knife and the trough, that as the former comes down upon the straw they shall concur in gathering and forcing it into a compact state. The same end may be partially attained by giving the described shape to the knife alone. I intend sometimes to surmount that part of the trough which is against the knife, by a short angular or curved piece in the same form with the trough inverted, for the purpose of keeping the upper portion of the straw more completely together whilst feeding. The feeding may be performed in any of the usual ways.

What I claim as my invention, and which I intend to secure by letters patent, is the angular, or curved, form of the knife above described, whether used with or without a trough, similarly formed for the purpose set forth. I do not claim the angular trough when used alone, the same having been previously employed, but without an angular or curved knife, such as is herein described.

ISAAC S. WRIGHT.

Specification of a patent for a method of preventing ale, beer, and other malt liquors from becoming acid in warm weather. Granted to JOSIAH STOWELL, *Manchester, Hillsborough county, New Hampshire, February 5th,* 1836.

To all to whom these presents shall come, be it known, that I, Josiah Stowell, of Manchester, in the county of Hillsborough, and State of New Hampshire, have discovered and applied to use a new and useful method, or process, for preventing ale, beer, and other malt liquors, from becoming acid, or sour, in warm, or hot, weather, and from preventing the wash, or mash, of distillers, from becoming acid: and that the following is a full and exact description thereof.

To preserve malt liquor where the temperature of the weather is from seventy-four to ninety-four degrees, Fahrenheit's thermometer, for every

one hundred and seventy gallons of liquor apply one pound of raisins in the following manner: Put the raisins into a linen, or cotton, bag, and then put the bag containing the raisins in the liquor before fermentation. The liquor may then be let down at sixty-five, or as high as seventy degrees Fahrenheit's thermometer.

The bag containing the raisins must remain in the vat until the process of fermentation has so far advanced as to produce a white appearance, or scum, all over the surface of the liquor, which will probably take place in about twenty-four hours. The bag containing the raisins must then be taken out, and the liquor left until fermentation ceases. The degree of heat in the place where the working vat is situated, should not exceed sixty-six, nor be less than sixty degrees of Fahrenheit's thermometer.

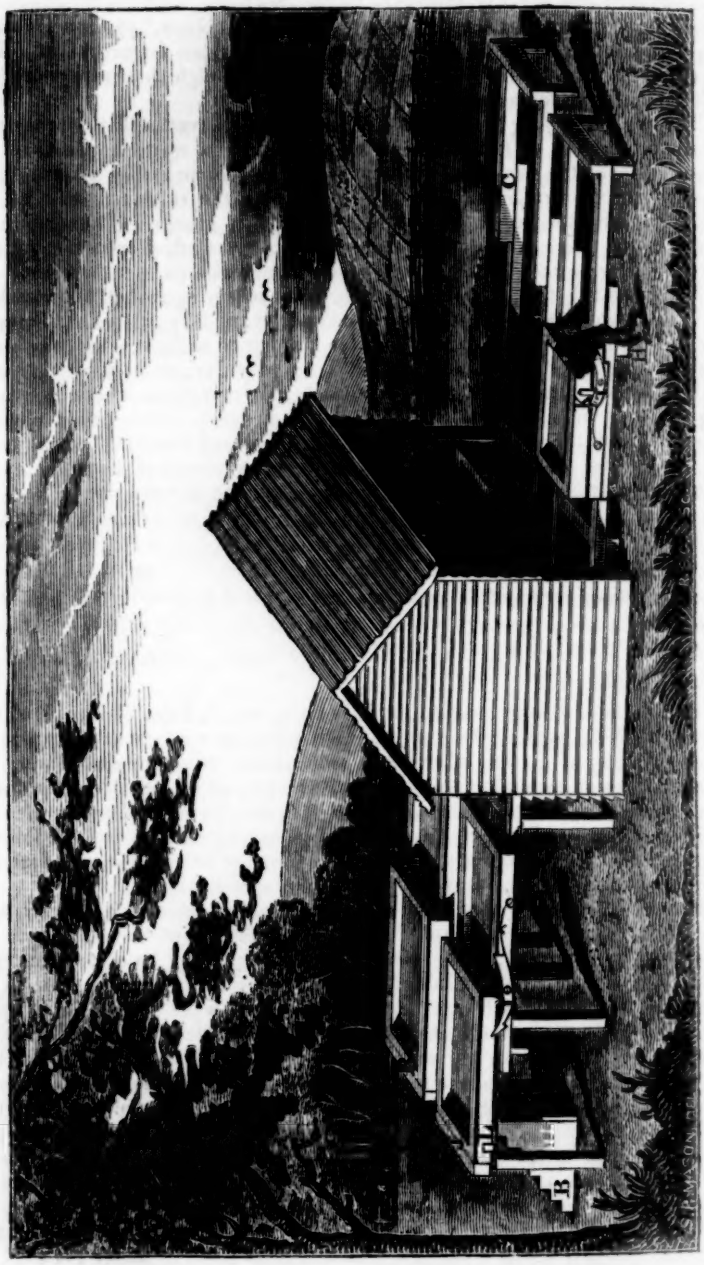
To prevent distillers' wash, or mash, from becoming acid in hot weather, put about two pounds of raisins into one hundred and fifty gallons of the mash, the raisins to be chopped and put into the liquor without a bag, the wash may be let down into the working vat at seventy-five, on eighty degrees of Fahrenheit's thermometer, if the temperature of the place where the working vat may be, does not exceed seventy degrees. One pound of hops should be put into the wash, or mash, vat, for every eight bushels of malt, at the time of mashing, and three-fourths of a pound of hops for every bushel of malt brewed, to be boiled in the liquor in the copper.

JOSIAH STOWELL.

Specification of a patent for an apparatus for the drying of cotton and other articles, and of protecting them from the effects of rain and storms. Granted to JOHN PHILBRICK, *Wilkinson county, Mississippi, February 12th,* 1836.

To all whom it may concern, be it known, that I, John Philbrick of the county of Wilkinson, in the State of Mississippi, have invented an apparatus for the drying of cotton, after it has been picked from the plant, and of a great variety of vegetable and other substances, which require exposure to the sun and air; and by which apparatus they may be immediately protected from the effects of rain and storms; and I do hereby declare that the following is a full and exact description thereof, reference being had to the drawing which accompanies, and makes a part of, this specification.

I erect a staging, consisting of parallel rails, which are to support platforms, troughs, or cars, upon which the cotton, or other articles, to be dried, are to be spread. These cars, or platforms, may be of any convenient dimensions, but for the sake of description, we will suppose them to be made five feet wide, and eight feet long, and the wheels, or rollers, upon which they run, to be six inches in height. In the accompanying drawing one of these rails is marked with the letter C, and rises six inches, or the height of the platform, above the rail upon which it reclines at its left end. P, B, K, L, are platforms, troughs, or cars, which rest and run upon the rails, having wheels, or rollers, upon their under sides for that purpose. The rails upon which the platforms rest, rise one above the other in the form of steps, as seen in the drawing; the platform marked K, is represented as having passed from the right hand rail on to the next platform, having been pushed forward by the man, H, and now stands upon the platform on the next rail, against which it catches, and both pass together under the shed in



the centre, the pair, marked P, being shown as already there. Those at the left hand of the shed are to be slid in, in the same way, when necessary, and pass above the others. I, is a latch, or catch, by which the two platforms are held together, or released, at pleasure. B, are movable steps, for conveniently reaching, charging, and discharging, the platforms.

Although two only of such platforms are represented as extending on each side of the shed, the number to be used is limited only by the convenience with which they may be managed; and this is the case also with their demensions. The mode of managing them also, will admit of being varied, whilst the principle upon which they operate will remain unchanged. Thus, for example, the shed may be made to cover the highest platform, and be itself pushed on, so as to gather all the cars, or platforms, under it, in its progress; the platforms may be in a single row, or there may be two or more rows in width, two being shown in the drawing. The platform may be run under the shed by hand, or by means of a winch with a windlass and ropes, or otherwise.

Having thus fully exemplified the general construction and use of my said apparatus, I wish it to be distinctly understood, that I do not intend, by the examples given, to limit myself thereto, but to vary the same in any way I may think proper, whilst the proposed end is attained by analagous means. What I claim as my invention, is the construction of a rail way, in successive steps, and having upon them cars, or platforms, upon which articles to be dried may be exposed to the sun and air, and which may, in a few seconds, be posited upon each other under a shed, to protect them from the weather when necessary, in the manner, or upon the principle, herein set forth.

JOHN PHILBRICK.

Progress of Physical Science.

Absorption of light by nitrous acid gas. Sir David Brewster has found that heat so modifies the absorptive power of this gas for the different coloured rays, that while at ordinary temperatures it has an orange colour, by raising the heat it becomes red, and finally black, not a ray of any colour penetrating it. This gas produces in a spectrum formed from artificial light, dark bands analagous to those exhibited by the solar spectrum. By improving the arrangements and methods of observation originally devised by Fraunhofer, of Munich, Brewster has succeeded in detecting two thousand easily recognised portions of the spectrum, separated by thin dark lines, resulting from the absorption of specific rays.

Apparent irregularities in the dark bands of the solar spectrum, were traced to the greater or less proximity of the sun to the horizon, the effect being greatest when the sun sinks below the horizon.

Sir David Brewster infers from a comparison of the lines in the solar spectrum with those produced in the spectrum from artificial light by nitrous acid gas, that the same absorptive elements which exist in the gas also exist in the atmospheres of the sun and of the earth.

Liquid nitrous acid produces none of the fixed lines above alluded to.

Abstract from Lond. and Edin. Philos Mag. May.

Fact in the theory of vision. On the retina and pigment of the eye of the calamary (Sepia Loligo). It will be recollected that an important argument in favor of that theory of vision which assigns the choroid coat and

not the retina as the seat of vision is drawn from the supposed structure of the eye of the cuttle fish. Mr. T. W. Jones has recently made a new dissection and microscopic examination of the eye of the Sepia, in which he finds that the supposed pigment in front of the retina is not really such, but a nervous expansion of a peculiar texture, tinged of a reddish brown colour, a circumstance which has given rise to the error of supposing it merely a pigment. Lond. and Edin. Philos. Mag January.

Fox's dipping needle deflector. This is a compendious instrument for determining the magnetic dip, intensity, and variation, invented by R. W. Fox, Esq. of Falmouth, England. It consists of a dipping needle accurately poised on an axis passing through the centre of gravity, to be deflected from the position of the dip by two bar magnets fitting into tubes attached to the back of the instrument, and the tubes being capable of motion round the axis of the needle so as to produce a greater or less proximity of the magnets to the poles of the needle. The needle having first been brought into the plane of the meridian, the approximate dip is obscured while the bar magnets or deflectors are not in place. The plate to which the deflectors are screwed is then moved to make a convenient angle with this dip and the magnets inserted the north pole of one near the north pole, and the south pole of the other near the south pole, of the dipping needle. The needle is thus deflected to a certain angle which is measured. The deflectors are then moved by moving the plate which carries them until they make the same angle with respect to the first dip, but on the opposite of it. The needle is thus again deflected, but in the opposite direction, and the half sum of the observed angles is the dip. By varying the position of the deflectors several observations may be obtained on different parts of the limb of the instrument, and, with a greater or less leverage, in the force of terrestrial magnetism. The relative intensities are observed by the amount of deflection produced by the magnets at a given angular distance from the line of dip, or by weights placed upon a flexible cord passing over a wheel attached to the axis of the needle, either with or without the use of the deflectors. A telescope attached to the plate or arm, carrying the deflectors, serves to determine the variation by a star, or by the image formed by a lens upon a plane of plaster of Paris, when an observation of the sun on the meridian is preferred. The readings of the vertical circle on which the needle plays are made accurate by a second graduated circle, placed near to the front of the box and of course between the eye and the needle. Verniers are provided for reading the angle of the deflectors and the azimuths. The instrument is provided with the usual means of levelling. When packed, the magnets form a circuit, with a view to a permanent condition in the several needles, or bars. Ann. Rep. Cornwall Polytech. Soc.

On the electrical relations of certain metals and metalliferous minerals.—Mr. R. W. Fox finds that the crystalized grey oxide of manganese, holds a much higher place in the electro-negative scale than any other body with which he has compared it, when immersed in various acids, and alkaline solutions. This and some of the other bodies examined by him, rank thus: 1, manganese; 2, rhodium, loadstone, platinum, arsenical pyrites, plumbago, nearly equal; 3, iron pyrites, copper pyrites nearly equal to the second; 4, salina; 5, standard gold; 6, copper-nickel; 7, silver; 8, copper; 9, sheet iron. Extract from Trans. Royal Soc. Lond. 1835.

On the properties of liquid carbonic acid. According to M. Thilorier, this liquified gas presents the strange and paradoxical fact of a liquid more expansible than the gases themselves: from 32° to 86° Fahr., its volume

increases from 20 to 29, that is to say, that at 86° Fahr., the increase of volume is nearly equal to half the volume at 32° Fahr. Its expansion is four times greater than that of atmospheric air, which from 32° to 86° Fah. only expands $\frac{30}{267}$, whilst the expansion of liquid carbonic acid on the same scale is $\frac{116}{267}$. If the temperature of a tube containing a portion of liquid carbonic acid is raised, this liquid boils, and the empty space above the liquid is saturated with a greater or less quantity of vapour according to the elevation of the temperature. At 86° Fahr., the quantity of liquid at 32° Fahr. sufficient to saturate the empty space, is represented by a portion of liquid equal to one third of the space in which the vaporization has been effected. At 32° Fahr. the portion of liquid of saturation is only $\frac{1}{12}$ of the space saturated.

The pressure of the vapour formed by the liquified gas from 32° to 86° Fahr., amounts from 36 to 73 atmospheres, which is equivalent to an increase of one atmosphere for every centigrade degree. It is important to observe that the weight or density of the vapour increases in a much greater proportion than the pressure, and that the law of Mariotte is no longer applicable within the limits of the liquefaction. If the density of the vapour is taken for the base of the pressure, the pressure at 86° Fahr. will be equal to 130 atmospheres, whilst the manoscope will only indicate 73 atmospheres. If a tube of glass containing a portion of liquid and a portion of gas be heated, two contrary effects will take place:

1st, the liquid will augment by expansion;

2nd, the liquid will diminish by vaporization.

The thermoscopic effects are very different according as the portion of liquid is greater or smaller to the portion of gas; the liquid in the tube will either expand, contract, or remain stationary. These anomalies furnished the means of verifying the numbers which the preceding researches had given on the expansion and vaporization. According to these numbers, the points of equilibrium above which the liquid increases, and below which it diminishes on the addition of heat, result from such a proportion when empty or full, that at zero the liquid occupies $\frac{13}{30}$ of the whole tube. If the liquid at 32° Fahr. occupies one third of the tube it seems as a retrogade thermometer, of which the liquid increases by cold, and diminishes by heat. If the liquid at 32° Fahr. occupies two thirds of the tube it acts as a regular thermometer; that is to say, the liquid increases and diminishes according to the laws of expansion. This thermometer is limited at 86° Fahr. as at this temperature the tube is entirely filled by the liquid.

The specific gravity of this liquefied gas at 32° is 0.83, water being 1. It presents the singular phenomenon of a liquid which from — 68° to + 86° Fahr., runs through the scale of densities from 0.90 to 0.60. It is insoluble in water, with which it does not mix; but is soluble in alcohol, æther, naphtha, oil of turpentine, and sulphuret of carbon, in every proportion; it is decomposed in the cold, with effervescence, by potassium; it does not act sensibly on lead, tin, iron, copper, &c.

When a jet of liquid carbonic aid is directed upon the bulb of an alcohol thermometer, it falls rapidly to — 194° Fah.; but the frigorific effects do not correspond with this decrease of temperature, which is accounted for by the almost absolute want of conducting power, and the little capacity for heat, of the gases; therefore the intensity of the cold is enormous, but the sphere of action is limited in some measure to the point of contact. If the gases have little effect in the production of cold, such is not the case with the vapours, of which the conducting power and the capacity for heat are

much greater. If æther, for instance, could be placed in the same conditions of expansion as the liquefied gas, a much greater frigorific effect would be obtained than by liquified carbonic acid. To accomplish this object it is necessary to render æther explosive, which is easily effected by mixing æther with liquid carbonic acid. In this intimate combination of two liquids which dissolve one another in every proportion, the æther ceases to be a liquid permanent under the pressure of the atmosphere; it becomes expansive similar to a liquefied gas, at the same time preserving its properties as a vapour; that is to say, its conductibility and capacity for caloric.

The effects produced by a tube filled with explosive æther are remarkable; a few seconds were sufficient to congeal 722 grains of mercury in a glass vessel. On exposing the finger to the jet which escapes, the sensation is intolerable, and seems to extend much further than the point of contact.

M. Thilorier intends to replace æther by sulphuret of carbon; and it is probable that the effects obtained will be still more powerful.

Annales de Chimie. et de Phys and Lond. and Ed. Phil. Mag.

Solidification of Carbonic Acid. M. Thilorier has read to the Academy of Sciences a memoir containing an account of the means by which he rendered carbonic acid solid; and he also gave some details respecting liquid carbonic acid.

He finds the finds the specific gravity of the liquid acid to be .83, water being 1.; it dissolves in all proportions in alcohol and æther: potassium decomposes it, but the common metals do not. A jet of carbonic acid, directed upon a spirit thermometer, caused it to fall 194° below zero Fahr. The cold would have been still greater if the bulb of the thermometer could have been entirely covered by the jet.

The solidification of carbonic acid was effected in the following manner: a jet of liquid carbonic acid was received in a glass vial; the expansion of which it undergoes is about 400 times its original volume, and by this so intense a cold is produced, that one part of the carbonic acid congeals in a white powder and adheres to the glass. This powder exists for some minutes, and without any pressure. If the finger be placed in solid carbonic acid, the heat converts it into gas, the expansion of which repels the finger. A few grains of this powder, closed in a vessel, soon expelled the cork.

Solid carbonic acid contains a little water, which is doubtless derived from the moisture of the air. In order, however, to remove all doubts, it would be necessary to get rid of the hygrometric moisture, both of the air and of the vessels, because it might be supposed that this water facilitates the congelation of the acid, as is the case with chlorine.

As to the temperature of this congelation, it was determined by using a spirit thermometer graduated to 187° below zero, to which about 44° must be added for the tube of the thermometer which could not be cooled, so that the cold observed was not less than 231°*.

These experiments were verified by commissioners, among whom were MM. Thenard and Dulong.

Journal de Chim. Med., tome ii. p. 3, and Lond. and Edin. Philos. Mag.

Water of the Elton, Dead, and Caspian Seas.† The Elton sea lies to the east of the Volga, 274 versts (181¼ miles), south from Saratov. Its greatest diameter, from east to west, is 17 (11¼ miles), and its smallest diameter 13 versts, (8½ miles).

* These are lower temperatures than have ever before been artificially produced, and lower also, we believe, than any which have yet been observed in nature.—Ed.

† Poggendorff's Annalen xxxv. 169.

The specific gravity of the water, at 53½°, is 1.27288, according to Rose. Its contents are, according to Rose and Erdmann:—

	ROSE.	ERDMANN.
Chloride of sodium,	38.3	71.35
Chloride of potassium,	2.3	
Chloride of magnesium,	197.5	165.39
Sulphate of magnesia,	53.2	18.58
Sulphate of lime,		.36
Sulphate of soda,		3.84
Carbonate of magnesia,		.38
Water and organic matter,	708.7	740.10
	1000.0	1000.00

When the temperature of the sea falls, Epsom salt precipitates. Here it is evident that the specific gravity and composition must change with the temperature. The shore of the Elton sea exhibits, in summer, crystals of gypsum and common salt; and, in winter, besides these, Epsom salt, which, in summer, is again dissolved, so that pure common salt may be obtained here. In the cool summer nights, according to Pallas, Epsom salt is deposited, and is again dissolved during the day. The greater the quantity of chloride of magnesium and Epsom salt, so much the less is there of common salt; which, from the elevation of the temperature, dissolves in no greater quantity in the same. Hence, the reason for the small quantity of common salt which Rose obtained. When an analysis of such a saturated water is given, it is absolutely necessary to give the specific gravity and the temperature. The reasons given are sufficient to account for the difference in the two analysis.

Erdmann found the constituents of the Bogden sea,

Sulphate of lime,	.74
Sulphate of magnesia,	10.30
Sulphate of soda,	215.76
Muriate of lime,	8.85
Muriate of magnesia,	48.53
Water,	715.72
	1000.00

The water of the Elton sea resembles that of the Dead sea, but the latter has a less specific gravity, and a smaller quantity of solid constituents. The quantity of salt diminishes when the Jordan is overflowed. Gay Lussac allowed the water to cool to 19° F. without separating any salt; while Klaproth states, that at the bottom of the flask which contained the specimen which he examined, crystals of common salt were deposited, which soon disappeared. The specific gravity of the Dead Sea varies, and the reason is obvious. Macquer, Lavoisier, and Sage found it 1.240; Marcet and Tennant 1.211; Klaproth 1.245; Gay Lussac at 62°.6, 1.2283; Hermbstadt at 60° 1.240. The proportion of ingredients also varies. Gay Lussac found them 26.24 per cent.; consisting of chlorides of sodium, calcium, magnesium, and potassium, and traces of gypsum, differing from that of the Elton Sea by the absence of Epsom salt, and the presence of chloride of calcium.

According to Marcet, the specific gravity of the water of the Sea of Urmia is 1.16507, and its constituents 22.3 per cent, consisting of common salt, Epsom salt, and sulphate of soda. The saline contents of Urmia and

the Dead Sea are, therefore, inferior to those of the Elton Sea. Rose has appropriated all the sulphuric acid to the magnesia, because he has found that when common salt and Epsom salt are dissolved in a sufficient quantity of water and evaporated in a summer heat, the two salts separate; and when much common salt is dissolved along with a small quantity of Epsom salt, a part of the common salt separates first, and then the Epsom salt, while common salt remains in solution; as by the heat of summer, Epsom salt is less soluble than common salt. When the temperature is raised above 122° F. or sunk to zero, in both cases, glauber salt and chloride of magnesium are formed.

Rose found the specific gravity of water brought from the Caspian Sea 75 versts from the islands formed by the Volga, at 54½°, 1.0013; and its contents,

Chloride of sodium,	.754
Sulphate of soda,	.036
Sulphate of lime,	.406
Bicarbonate of lime,	.018
Bicarbonate of magnesia,	.440
Water with a small quantity of organic matter,	99.348
	1000.000

Record Gen. Sc. February.

Rationale of cold produced by sulphate of Soda and muriatic acid. Doct. Kane makes the following statement in a paper on the action of muriatic acid on the sulphates. "It has been long known that Glauber's salt treated with muriatic acid constitutes a powerful freezing mixture, the theory of which is at once explained by the results of the experiment. When sulphate of soda is dissolved in liquid muriatic acid there are formed bisulphate of soda and chloride of sodium, and as the former salt crystalizes with only four atoms of water, the remaining quantity of the water of crystalization of the Glauber's salt, is disengaged to the amount of sixteen atoms." "This large quantity of water suddenly separated from a state of combination in which it had been solid, produces, by its absorption of caloric of liquidity, the frigorific property." Lond. and Edin. Philos. Mag. May.

Progress of Practical and Theoretical Mechanics and Chemistry.

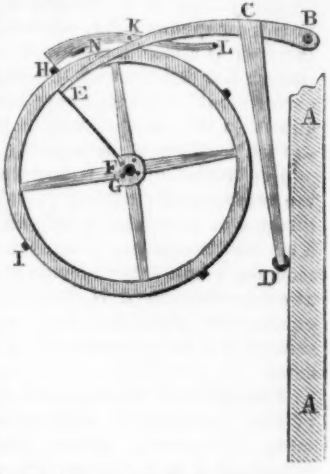
*Description of a new Detached Pendulum Escapement, invented by Alexander Witherspoon, watch-maker, Tranent.**

A, is the pendulum rod, represented as having nearly reached the limit of its vibration to the left, and as about to touch the small friction roller attached to the arm C D of the impeller B C D E. The upper part of the pendulum rod is broken off to show the axis B, concentric with the axis of motion of the pendulum itself, on which the impeller turns. The two axes coinciding in direction, no rubbing ought to take place though there were no friction roller at D; the roller is merely placed there for the purpose of preventing the bad effects of any small error in the adjustment. In the drawing, the weight of the impeller is represented as sustained, through the intervention of the slender spring E F, by the lifting pin F, which is placed near the centre of

* Read before the Society of Arts, 13th April, 1831.

the scapement wheel; this wheel itself being prevented from advancing by the opposition of the detent to the detaining tooth H. The end of the spring E F is furcated, the pin resting in the bottom of the notch, and keeping the spring bent upwards from its natural position by a distance rather more than the minute diameter of the pin.

The oscillation of the pendulum is so nearly completed, that, when finished, the impeller B C D E may be lifted till the extremity of the spring just escapes from the pin F, and takes up a position a little to the left of its present one. The whole weight of the impeller now rests upon the pendulum; but when the pendulum begins to retire, the extremity of the spring is not arrested by the pin F, but passes close by it, directing its motion towards the pin G.



The impeller continues to press against the pendulum rod, and increases its momentum until the arm B E reaches a pin at L, projected from the branch of the detent H K L. After this the pendulum continues its oscillation uninterrupted.

The detent turns upon an axis at K, so that the pressure of the impeller upon the pin L elevates the detent, and allows the detaining tooth H to pass forward.

Just at this moment the second lifting pin G is entangled between the sides of the notch in the extremity of the spring E F; the motion of the wheel, therefore, again elevates the impeller, the rise of which allows the detent to descend upon the stop N and await the arrival of the second detaining tooth I, whose arrest is announced by a distinct beat.

The whole of the escapement has now assumed a position exactly analogous to that which it had at first, and awaits the approach of the pendulum, to solicit anew its maintaining power.

During the whole of this action the pendulum is never connected with the train of wheels. The only body which acts upon it is the impeller, and this communicates to it the impulse which is generated by a descent of a constant weight through a determinate distance. The lightness of the parts renders oil either on the axis B or on the pin F unnecessary, so that this action is entirely freed from any error which might have arisen from changes in the adhesiveness of oil. In order to solicit the impulsion, the pendulum has to raise the impeller through a distance determined by the thickness of the pin F, and has to overcome the friction of the spring against that pin. But the diameter of the pin is so small and the flexure of the spring so slight, that the errors caused by them must be exceedingly small, especially when we consider that they are not liable to any variation. The unlocking of the detent H, instead of being performed by the pendulum, is effected by the impeller; so that, however variable may be the maintaining force, provided it is never so small as to be unable to raise the impeller, nor so great as to prevent the unlocking of the detent, the going of the clock can never be in the slightest degree affected.

When the pendulum rod reaches the friction-roller, it is moving with a

very small velocity, since it is almost at the limit of its oscillation, so that nothing analogous to the blow of the common 'scapements takes place; and even the sudden removal of the pressure of the impeller, when the arm reaches the pin L, can hardly excite any tremour in the pendulum.

In almost all delicate escapements, high finish in the rubbing surfaces and great accuracy in the workmanship, are absolutely essential to good going. In every case the advantage of careful execution cannot fail to be felt; but in this escapement that advantage is by no means great. The execution of the train is almost a matter of indifference; and even in the most vital part, though the distances of the detaining teeth were inaccurately laid off, the errors would occur at every revolution of the escapement wheel, and their effects on the going would be generated and destroyed in the same period, so that the daily or hourly rate could not be affected.

The motion of the train resembles that of a perfect dead-beat, although the escapement certainly partakes of the nature of the recoil, since the unhooking of the spring is only effected after a slight elevation of the impeller. The beat is made only at each second oscillation, so that, in order to beat seconds, a half second pendulum must be used. In escapements which beat at each vibration, it is difficult to have two consecutive intervals exactly equal,—the one being less, and the other as much more than an exact second; but when the beat is given only on one side, no such inequality can exist.

The parts of the impeller are liable to expansion by heat, but the effects of this can easily be obviated by extending an arm made of some expansive metal such as zinc, on the other side of the axis B, while the branches represented in the figure are made of glass. This arm also will allow a weight to be slid along it so as to regulate the intensity of the impulse.

When the spring is released from the pin F, it does not merely assume its position of rest, but continues for a moment to vibrate on each side of it. As there might appear to be some risk of its catching again the same pin, a damper has been put on to diminish these oscillations; but, as in some other escapements which I have constructed on the same principle, it was not found necessary; it has been omitted in the drawing. I need hardly point out that the number of lifting pins is not limited to four. Jameson's Journal.

Capillary Tubes in Metal. The sum of five pounds was presented to Mr. J. Roberts, 64 Queen Street, Cheapside, for his method of subdividing a pipe into capillary tubes; a specimen of which has been placed in the Society's Repository. The thanks of the Society were voted to Hen. Wilkinson, Esq. Pall Mall, for his method of producing a ring of capillary tubes. For gas-burners, for the safe combustion of mixtures of oxygen and hydrogen, and for other purposes, it is often desirable to divide the end of the discharge-pipe into fine capillary tubes, of the depth of half an inch or more. It is difficult and expensive to bore such apertures in a piece of solid metal, and it is hardly possible to be executed at all if the apertures are required to be of very small diameter.

Mr. Roberts very ingeniously and expeditiously subdivides the end of a metal pipe into small tubes of any required depth, by means of pinion-wire. Pinion-wire is made by taking a cylindrical wire of soft steel, and passing it through a draw-plate of such a figure as to form on its surface deep grooves in the direction of radii to the axis of the wire: the ribs which separate these grooves from one another may be considered as leaves or teeth, and of such wire, when cut into proper lengths, are made the pinions used by watchmakers. Hence arises the name by which this wire is commonly known.

If now a piece of this wire be driven into the end of a brass pipe of such a size as to make a close fit with it, it is evident that that part of the pipe has thus been subdivided into as many smaller tubes as there are grooves in the wire. By using a draw-plate fitted to make smaller and shallower and more numerous grooves than are required in common pinion-wire, it is manifest that wires or cores may be produced, which, when driven into metal pipes, as already described, will subdivide them into capillary tubes of almost any degree of tenuity.

Mr. H. Wilkinson's method is described in the following letter:

Pall Mall, May 25th, 1835.

Sir, In the course of some experiments on artificial light, which I was engaged in about twelve months since, I was desirous of obtaining a great number of extremely minute apertures for a gas-burner; and, finding it impossible, in the ordinary way, to obtain them, a new method occurred to me, which immediately produced the desired effect. I showed it at the time to several eminent scientific men, who were unable to conceive how these apertures were formed; and, as I made no secret of the method, they were equally pleased at the simplicity of the operation; and the specimen herewith sent has been exhibiting at the Gallery of Practical Science for several months. I did not attach much importance to it myself; but, as I do not find that it is at all known, and now think it might be useful in a variety of ways, I have sent it to you to be laid before the Society; and should they be of the same opinion, I shall feel much pleasure in communicating the mode of operation, by which any number of apertures, hardly visible to the naked eye, and of any length (*even a foot, if required*), may be made in any metal in *ten minutes!*

I am, sir, &c. &c.

Henry Wilkinson.

A. Aikin, Esq. *Secretary, &c.*

The process consists merely in turning one cylinder to fit another very accurately, and then, by milling the outside of the inner cylinder with a straight milling tool of the required degree of fineness, and afterwards sliding the milled cylinder within the other, apertures are produced perfectly distinct, and of course of the same length as the milled cylinder. A similar effect may be produced on flat surfaces, if required. H. W.

Trans. Lond. Soc. Arts.

Duty of Cornish Steam Engines. The mode of estimating the performances of steam-engines, *by the number of lbs. lifted one foot high by the consumption of a bushel of coal*, was introduced into Cornwall by Watt, when it became requisite to keep a regular account of the work done and the coal consumed, for the purpose of calculating his share, which was one-third of the saving of coal effected by his engine in comparison with Newcomen's.

The performance of two atmospheric engines, at Poldice, had been ascertained as a standard of comparison, and declared by a committee: for convenience the present dynamic unit was afterwards adopted, and the work done when thus expressed was equal to 7,037,800 lbs. lifted one foot high by each bushel of coal. A dispute arose in 1798 between Messrs. Boulton and Watt and the mining adventurers in Cornwall, and it became necessary to ascertain the average duty, which was proved to be 17,671,000 lbs.: this was rather less than in 1793, when the average of seventeen engines was 19,569,000 lbs. After the expiration of the patent in 1800, no

accounts were kept of the work performed by the engines under the direction of the mining engineers.

In August, 1812, the average duty of several engines on a month's trial proved to be only 13½ millions, and the truth of the prevailing opinion became apparent, that less work was done than during Watt's patent. The present monthly report of 'work performed' was then established under the management of Mr. Lean, and since his decease has been conducted by his son, so that there exists a series of reports for twenty-two years, showing the duty for each month, of the engines employed in Cornwall, including the size of the pumps, and their depths, number of strokes, bushels of coal consumed, &c. &c.; a reference to which would point out at what period, and by whom, every increase of duty was obtained.

Woolf introduced the use of high pressure steam worked expansively in two cylinders, and first succeeded in performing fifty millions. Other engineers worked high steam expansively in one cylinder, which plan became general on the introduction of Trevithick's cylindrical boilers.

Several engines now constantly perform a duty exceeding 70 millions, double that of the best of Watt's, and of which one has reached 91,200,000; another mentioned last meeting by our President, averages about 90,000,000; its best performance was 97,300,000, for one month.

Part of the increase of duty must be attributed to the improved pitwork; the most rapid increase, however, took place on the introduction of a most complete system of *clothing*, the present practice of which is so efficient, that in two instances, though the steam in the *jacket* was at least 270°, the outside casing did not exceed 78°;—the thermometer was covered by a silk handkerchief to prevent the draught of air in the engine-house affecting the results;—the air outside was in one experiment 56°, and in the engine-house about 66°;—the surface of the ashes over the boilers was about 90°."

Ann. Report Cornwall Polytech. Soc.—Lond. Mech. Mag. April.

Progress of Civil Engineering.

Observations on the Classification and Details of the Architecture of the Middle Ages. By E. B. Lamb, Esq. Architect.

(continued from p. 141.)

The Third Class commenced about 1377, and continued till 1460. In the first division of this class the equilateral arch was given up for one struck with two centres, of an obtuse form, which was much used with the four-centred arch (*Fig.* 11,). The window heads were filled with tracery in the perpendicular lines (*Fig.* 12,) the predominating charac-

Fig. 11.

Fig. 12

ter of the whole of this class, and the mouldings, became gradually more complex. The windows, for some time, retained the simple arch, the

compound arch only being used in small openings. Windows were divided in their height by transoms, and sometimes columns were added to mullions. *Fig.* 13, is a selection of a small window jamb, at Ifly Church, which shows the general character of the mouldings of the second division of this class. *Figs.* 13, 14, 15, 16, 17, all resemble each other, and mark the distinctness of the mouldings from those of the second class. In these sections it will be observed, that, although the mullions do not, in a very great degree, appear to differ from the mullion mouldings of the second class, yet the extended hollow moulding in

Fig. 13.

Fig. 14.

the jamb is perfectly in character with the depressed simple, and also with the compound, arch. It is very different from the easy flowing lines of the second class; and the mullions, though they appear, as I before mentioned, to resemble those of the other class, upon closer examination will be found generally to be of a more bulky character. The elegant flowing lines of the second class are, indeed, in no instance to be seen in this, and the expression is of a widely different nature; for,

Fig. 15.

Fig. 16.

while the former indicated a graceful undulating character, without interruption, the latter is expressive of a degree of abruptness and crispness peculiarly its own: at least, these are impressions made upon me by these two classes; and they appear to arise from the obvious difference in the expression. A profusion of heraldric devices were among the principal decorations of this period. Among the examples of this class are, of the first division, New College Chapel, Oxford; a window in Westminster Hall; and the west door of St. Saviour's Church, which is a fine specimen of the middle division; a window in St. Peter's Church, Oxford, of which *Fig.* 14, is the section of the jamb; also Merton College Chapel, Oxford, 1424; and King's College Chapel, Cambridge, 1443. Of the latter, or transition, division of this class, may be mentioned the Chapel on the Bridge, Wakefield, Yorkshire.

The Fourth Class, is a continuation of the same general forms, from 1460 to about 1547. The mouldings, arches, ornaments, &c., were now wrought to a greater degree of richness; and the most delicate work was bestowed on canopies, nitches, groinings, and, in fact, on every part, the principal aim appearing to be to produce stone carving of a net-like character, rather than to preserve good composition by agreeable contrasts. The result of this lavish display of ornament ended in a generally depraved taste, and the consequent decline of the art. Examples of this class will be found in Magdalen College, Oxford, about 1473; centre tower of Canterbury Cathedral, about the same date; St. George's Chapel Windsor, 1481; and Henry VII's Chapel, Westminster, about 1503. In Henry VII's Chapel, and, in fact, in many of the buildings of the fourth class, we can trace a general decline in art, without alluding to the wearisome richness, which becomes fatiguing to the eye for want of repose. I have no doubt I lay myself open to much reproof for presuming to differ from the accepted opinion with regard to this class of architecture; but I think I need only refer to the exterior of Henry VII's. Chapel in vindication of my assertion. This exterior is cut into so many small parts, that there is scarcely any situation from which a pleasing view of it can be obtained; and the principal charm which it possesses in point of effect is borrowed from its contrast with the Abbey: the whole exterior, in short, is a multiplicity of angular projections, which throw no shadow, and, consequently, produce no relief. The interior is much better: the effect here is good; the light and shade, being distributed from the large clerestory windows, are more pleasing; and the fan-groining and pendants of the nave and aisles produce a rich effect: but, still, I cannot see the beauty of these angles and curves, even in the interior; though they are certainly better here than on the outside.

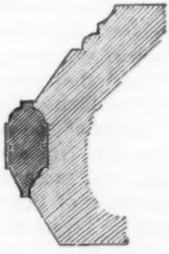
Fig. 17.

In the latter division of this class, the mouldings and mullions were changing their pure form, and becoming mixed with the Italian architecture, which was, about this time, making great progress in the formation of that mongrel style now called Elizabethan; and many examples of this transition work are to be seen in Oxford, Cambridge, and London. Eastbury House, Barking,

in Essex, is a fine specimen of the brick buildings of the early part of the reign of Henry VIII., and contains more pure mouldings than most of the other buildings of that time: it is built entirely of brick work; mullions, transoms, and the most delicate ornaments, being all executed in brick. *Fig.* 18, is a section of one of the window jambs and mullions. *Fig.* 19, is a section of a mullion and jamb of the transition character. In this figure it will be seen that the jamb mouldings are a hollow and ovolo, and that the mullion is a fillet on one side': the other side, in the same section, is to be seen in the second class occasionally.

Fig. 18.

Fig. 19.



The Elizabethan architecture now became the prevailing style, and continued to hold its rank until Inigo Jones succeeded in changing the public taste in favor of what was then called the perfect Italian style.

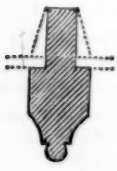
The characteristics of the Elizabethan style, are the regular entablatures, columns, pedestals, and arches of Italian architecture, interwoven with the pointed arches, enriched spandrils, heraldric devices, and other decorations of the Gothic. Orders were used over orders, and in situations where they were placed in direct violation to all reason. In one of the Colleges at Oxford, the whole of the five orders are piled one above another in one narrow front. These entablatures and columns were adorned with the most clumsy devices; such as scrolls abruptly terminating in angles, carvings of vegetables in bunches, &c., and buildings being surmounted with obelisks, balls, scrolls, and numerous fantastic devices, without the least reason being shown for their use. In some instances, this style has a very picturesque effect; and, when a sufficient excuse can be shown for its introduction in public buildings, that is the time, and the only time, where it should be introduced; but national buildings should be in a more perfect style. The bad taste shown by the building committee for the Houses of Parliament, in recommending this style of architecture for their Senate House, must be obvious to every person who is the least acquainted with its details: there is ample scope for talent in the pure Gothic style; therefore, why revive a style which only marked the decline of the art?

It only remains for me now to say a few words relative to the Gothic mullion. Windows are divided into lights by mullions of various sizes and sections; and each window consists of an outer arch, or frame, the jamb or architrave mouldings of which are perfectly distinct from the mullion, or column. Mullions are divided into orders; and the small mullion, which generally consists of a hollow and a fillet, or of a splay and fillet, is the first order: it is from this order that the cusps spring in every class; and for that reason it is sometimes called the casp mullion. Windows of two, three, and some-

times more, lights, have only one order of mullions, particularly windows of the second class; and this single order is continued through the whole of the ramifications of the window head. An increase of strength and richness was produced by the introduction of the second order of mullions; and this was obtained by increasing the thickness of the first order, and adding another moulding to the fillet; which, from the increased thickness, required something to fill up the fillet, and, at the same time, to add to its strength. *Fig.* 2, will show the two orders of mullions of the first class. These had different offices assigned to them: thus, the first order, being the smallest, formed the smallest composition; the second order, from its increased size, formed the larger divisions of the window; and so they might proceed to a third, fourth, fifth, &c., each successively growing out of the other: and the window, *Fig.* 3, will show their application. I need scarcely say, that the largest order of mullions contains all the others, so that the smallest goes round the whole of the window head. *Figs.* 5, 7, show only one order of mullions; *Fig.* 2, shows two orders of the first class; *Fig.* 9, shows three orders of the second class, the first of which is the tracery or cusp mullion; *Fig.* 10, shows one order. It will be observed that the tracery mullion is the same in every window in these figures; and that, though there are instances of two orders being used in tracery, even then the cusp proceeds always from the first order. The cusp rises out of the hollow of the first order, and, in the first class, frequently terminates with a flower, and sometimes square, in the second class it is formed, generally, by the intersections of two segments of circles, but is sometimes square, or a kind of blunted point; and, in the third and fourth classes, it terminates in an angle, and sometimes a flower is attached to it. These rules are not without exceptions; for the artists who could produce such wonderful combinations as are to be found in the architecture of the middle ages, so full of variety and originality in every class, would not be restrained, in the flights of genius, to the same forms or ornaments throughout the same building; and, in every building we examine, we find something to add to our stock of knowledge which we never dreamed of before.

In tracing the change of mullions through the different classes of Gothic architecture, it is curious to observe, that the mullions of the fourth class have been continued down to the present day in our sash bar. In Queen Elizabeth's time, windows were divided into a greater number of lights with transoms; in king James the First's time, they became still more numerous in their divisions, but the mullion was not so bulky; and by degrees the windows had as many transoms as mullions, while every fresh complication of mullions and transoms produced a decline in the thickness; and even the general introduction of the Italian style only tended to decrease the thickness of the mullion, but not to alter its general form.

Fig. 20. *Fig.* 21. *Fig.* 22.



I am not aware of the exact time when the lines and weights for windows

were first introduced; but when they were known they soon became very general, and, I have no doubt, assisted in the reduction of the mullion, which continued to dwindle to what are now called the ovolo, and the astragal and hollow sash bars. *Figs.* 20 and 21, will show these sections. *Fig.* 22, is the section of the mullion of Queen Elizabeth's reign. The great demand for novelty in the present day, and the use of large squares of glass, have been the means of producing new forms, which are so very thin as to be scarcely visible: these are designated by the titles of lamb's tongue, and the bevel bar.

In the foregoing remarks I have endeavored to give a classification of the architecture of the middle ages, very imperfectly, I am aware; but if these observations should induce some one to institute a fuller enquiry into the architecture of this country, and if my remarks should be of the least service to the general reader, in assisting him to find the cause which produced the great effects in the edifices of our forefathers, it will be a gratification to think that I have not studied in vain.

Henrietta Street, Brunswick Square, August, 1835.

On the Expansibility of different kinds of Stone. By Mr. Alexander J. Adie, Civil Engineer.—"This paper contains the results of an extensive series of experiments made upon different kinds of stone, as well as upon iron and upon brick, porcelain, and other artificial substances. The instrument employed was a pyrometer, of a simple construction, capable of determining quantities not greater than $\frac{1}{30000}$ of an inch. The length of the substances generally employed was 23 inches. The general result of these experiments is, that the ordinary building materials of stone expand but very little differently from cast iron, and that, consequently, the mixture of those materials in edifices is not injurious to their durability. The experiments from which the expansibility of the substances was numerically determined were made between the limits of the ordinary atmospheric temperature and that of 212°; steam being introduced for that purpose between the double casing of the instrument. The following results were obtained for the fractional expansion of the length, for a change of temperature of 180° Fahr.:—

Table of the expansion of Stone, &c.

	Dec. of length of 180° Fahr.		Dec. of length of 180° Fahr.
1. Roman cement,	.0014349	8. Peterhead red granite,	.0008968
2. Sicilian white marble	.00110411	9. Arbroath pavement,	.0008985
3. Carrara marble,	.0006539	10. Caithness pavement,	.0008947
4. Sandstone from the Liver Rock of Craigleith Quarry,	.0011743	11. Greenstone from Ratho	.0008089
		12. Aberdeen grey granite,	.00078943
		13. Best stock brick,	.0005502
		14. Fire brick,	.0004928
5. Cast-Iron from a rod cut from a bar cast 2 in. square,	.00114676	15. Stalk of a Dutch tobacco-pipe,	.0004573
6. Cast-Iron from a rod cast half an in. square	.001102166	16. Round rod of Wedgewood ware (11 in. long)	.00045294
7. Slate from Penrhyn Quarry, Wales,	.0010376	17. Black marble from Galway, Ireland,	.00044519

Proceedings of the Royal Society of Edinburgh. Jameson's Edin. New Phil. Journal.

Mechanics' Register.

Soap from Flints. Mr. Sheridan takes the common black flint, calcined, and reduces it to powder by wet-grinding; then mixes it with the caustic soda leys, or potash leys, and boils it till it attains saponification. The mixture so obtained* is added to the present soap materials after the latter have been boiled to that state when they have become soap, and are ready to be poured into the frames. The mixture, which has a high detergent quality, requires to be well crutched along with the soap materials; and when thus crutched together, the result is a soap of excellent quality. The mixture becomes intimately incorporated with the soap materials, and may be added in proportion of from 40 to 50 parts of the mixture to 50 of the soap materials. Thus the common silex, which is obtainable at a very low price, takes the place of tallow to the extent of nearly one-half. Lond. Mech. Mag.

Comparative table of Speed. From the Physical and Chemical Journal of Science, and the Arts of Husbandry in France, we make the following extract, which will be found no less curious than useful, and cannot fail to interest our readers:

	Feet per second.
The ordinary rate of a man walking,	4
Of a good horse in harness,	12
(Or 2,000 toises (yards) in 3 minutes).	
Of a raindeer in a sledge, on the ice,	26
Of an English race-horse,	43
Of a hare,	88
Of a man casting a stone with all his force,	60†
Of a good sailing ship,	19
Of the wind,	82
Of sound,	1,038
Of a cannon-shot (24-pounder)	1,300
Of the air which returns into space so divided,	1,300

Lond. Farmers' Mag.

List of American Patents which issued in June, 1836.

June.

380. *Oven.*—Wm. H. Atkins, Berkshire, N. Y. 2
381. *Cooking stove.*—E. G. Currier, Warner, N. Y. 2
382. *Cooking stove.*—E. G. Currier, Warner, N. Y. 2
383. *Plough.*—Jacob Plank, Carlisle, Penn. 2
384. *Generating light and heat.*—Horace L. Barnum, N. Y. 2
385. *Granite dressing machine.*—J. D. Buzzell, Cape Elizabeth, Maine, 2
386. *Cylindrical breaker.*—Smith Cram, N. Y. 2
387. *Chopping meat.*—J. Masser and S. Smith, Mayerstown, Penn. 2
388. *Smut machine.*—Robt. Engle, Burlington city, N. J. 2
389. *Stove for anthracite.*—Adrian Jones, Hartford, Conn. 2
390. *Blast furnace.*—Benjamin Kugler, Philadelphia, 2

* The compound here alluded to is a combination of silica (silex) and potassa (potash), and is frequently called liquor of flints. Silica is a body still generally ranked with the *earths*, which it resembles in many points, but it is, in its chemical relations, an *acid*, combining with alkalis, and forming salts, which are called silicates. It may be considered a curious fact, if the above statement be correct, that this weak mineral acid should be able to take the place of the weak animal, or vegetable, acids united with alkalis in ordinary soaps. B.

† We believe this calculation to be incorrect. A stone cast with the strength of a man's arm will outstrip a hare.

391. *Thrashing machine.*—Jacob S. Rollins, New Gloucester, Maine, 2
392. *Mowing machine.*—Henry Allen, Fayetteville, Tenn. 2
393. *Water wheel.*—Henry Allen, Fayetteville, Tenn. 2
394. *Pump, frictionless.*—Edward Whitfield, N. Y. 2
395. *Hemp &c. spinning.*—Moses Day, Roxbury, Mass. 2
396. *Clover cleaning.*—John Goodyear, South Middleton, Penn. 2
397. *Propelling boats, &c.*—Gideon Hotchkins, Broom county, N. Y. 2
398. *Cooking stove.*—Charles Higgins, Turner, Maine, 2
399. *Saw mill.*—Thomas B. Naylor, Jonesville, N. C. 2
400. *Tunnelling rivers.*—J. B. Bucklin and J. Jacobs, West Troy, N. Y. 11
401. *Metallic coffins.*—Jonas A. Grant, Richmond, Va. 11
402. *Cars, taking over elevations.*—Smith Cram, N. Y. 11
403. *Weaving, improvement in.*—Cullen Whipple, Douglass, Mass. 11
404. *Washing machine.*—Amory Davidson, Littleton, Mass. 11
405. *Boots, tucking machine.*—S. C. Blodgett, Rowley, Mass. 11
406. *Hubs for wheels.*—Jonathan Atherton, Philadelphia, 11
407. *Setting bones, apparatus.*—James H. Willard, Brownhelm, Ohio, 11
408. *Columns for building.*—Jordan L. Mott, N. Y. 11
409. *Iron and steel, making.*—William P. Boyden, N. Y. 11
410. *Distances, measuring.*—Rufus Porter, Bellerica, Mass. 11
411. *Horse power.*—Rufus Porter, Bellerica, Mass. 11
412. *Churn dash.*—Samuel Jackson, Jay, Maine, 11
413. *Screw, packing machine.*—Stephen Terry, De Kalb, Georgia, 11
414. *Endless chain propeller.*—Lewis Chevier, Philadelphia, 11
415. *Hat bodies, stiffening.*—J. P. Kettell and J. Wright, Worcester county, Mass. 11
416. *Garden Hoe.*—Isaac W. Averille, Plymouth, Mich. 11
417. *Bedsteads.*—Christian Knisly, Meadville, Penn. 16
418. *Malleable iron cannon.*—Geo. W. Chapman, N. Y. 16
419. *Oven, heating by anthracite.*—F. C. Tredwell, Brooklin, N. Y. 16
420. *Stove, conical.*—Robert Robertson, Albany, N. Y. 16
421. *Washing machine.*—Amos Sarcum, Troy, N. Y. 16
422. *Clover seed hulling.*—Cyrus B. Baldwin, Fincastle, Va. 16
423. *Scythe.*—Ezra Barnett, Warner, N. H. 16
424. *Cotton planting machine.*—Henry Allen, Fayetteville, Tenn. 16
425. *Churn.*—Amasa Wharff, New Gloucester, Maine, 16
426. *Plough.*—Joshua Gibbs, Canton, Ohio, 16
427. *Mortising machine.*—J. C. Channell, Dunstable, N. H. 16
428. *Planing machine.*—Lorrain Curtis, Sherburne, N. Y. 16
429. *Smut mill.*—John T. Towne, Mount Morris, N. Y. 16
430. *Stove, or air warmer.*—John J. Heintzelman, Philadelphia, 16
431. *Leather, shaving.*—Herkimer Johnston, Brooklin, Conn. 16
432. *Cooking stove.*—Will. A. Arnold, Northampton, Mass. 16
433. *Rice, &c. hulling.*—Lewis Cole, New Gloucester, Maine, 16
434. *Fire proof chest.*—James Matthews, N. Y. 16
435. *Mortising timber.*—Samuel E. Babcock, Alstead, N. H. 16
436. *Combing wool.*—S. and S. Couillard's assignees, Boston, Mass. 16
437. *Combs of metal.*—Henry Duvall, N. Y. 20
438. *Lamp burner, light house.*—Isaac Dunham, Bristol, Maine, 20
439. *White lead, &c.*—Edward Clark, Saugerties, N. Y. 20
440. *Cutting and planing stone.*—A. Clark & C. H. Boynton, West Stockbridge, Mass. 20
441. *Winding silk.*—Adam Brooks, South Scituate, Mass. 20
442. *Winding gimp or cord.*—Adam Brooks, South Scituate, Mass. 20
443. *Thrashing machine.*—J. Bailey and J. Sprinkle, Rockingham, Va. 20
444. *Horse power.*—William Whitman, Haverhill, N. H. 20
445. *Truss.*—John W. Newson, N. Y. 20
446. *Window fastenings.*—Marcus Merriman, jr., New Haven, Conn. 20
447. *Mortising machine.*—John Hawkins, Stockbridge, Mass. 20
448. *Stone cutting machine.*—J. and J. Sutton, Reading, N. Y. 20
449. *Rack wrench.*—Alonzo G. Hall, Troy, N. Y. 20
450. *Saddle, elastic.*—William McCormick, Bath county, Kentucky, 20
451. *Revolving lancet.*—T. C. Harrison, New Egypt, N. J. 20
452. *Clover seed, cleaning.*—Hildreth Robbins, Kennebec, Maine, 20

(TO BE CONTINUED.)

CELESTIAL PHENOMENA, FOR OCTOBER, 1836.

Calculated by S. C. Walker.

Day.	H'r.	Min.					
17	6	57	Im	Capricorni	,6,	N.132°	V.136°
17	8	10	Em			271	290
30	15	40	Im	α' Cancri	,6,	24	5
30	16	57	Em			315	311

Meteorological Observations for June, 1836.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P. M.	Barometer. Sun rise.	Barometer. 2 P. M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
	1	44°	54°	29.80	29.84	E.	Brisk.	.60	Cloudy—showers, rain in night
	2	54	61	29.76	29.76	E.	do.	.16	Drizzle—cloudy—rain.
	3	55	60	29.76	29.86	E.	Moderate.	1.00	Drizzle—cloudy—rain in night.
	4	56	64	29.81	29.80	do.	do.		Rain—Cloudy.
	5	58	67	29.85	29.90	E.NE.	do.		Drizzle—cloudy.
☽	6	57	67	29.90	29.90	E.	do.		Cloudy—rain.
	7	60	74	29.91	29.94	NE.	do.	.45	Fog—flying clouds, rain.
	8	64	74	29.90	29.96	E. SE.	do.	.07	Fog—flying clouds.
	9	64	86	29.97	29.97	SW W.	do.		Fog—clear.
	10	62	78	29.98	30.05	N.NE.	do.		Clear day.
	11	60	83	29.95	29.90	ES.	do.	.32	Fog—flying clouds, rain.
	12	64	79	29.83	29.80	W.	do.		Clear—flying clouds.
	13	58	74	30.00	30.05	E.SE.	do.		Floating clouds—clear.
	14	58	75	30.00	29.95	NE.N.	do.		Cloudy—clear.
	15	59	76	29.93	29.93	NW.	do.		Clear day.
	16	54	80	30.05	30.05	NW. W.	do.		Floating clouds, clear.
	17	66	86	29.90	29.90	W.	Brisk.		Clear day.
	18	68	89	29.85	29.85	W.	do.		Hazy—clear, thunder shower.
	19	68	86	29.80	29.75	N. E.	Gale.		Clear day—thunder shower.
	20	70	64	29.70	29.70	N.	Moderate.	1.30	Cloudy—rain, thunder & lightning
	21	54	60	29.70	29.70	E.SE.	do.		Drizzle—cloudy.
	22	55	66	29.83	29.85	S. E.	do.		Cloudy—cloudy.
	23	56	61	29.90	29.90	E.	do.		Cloudy—rain.
☾	24	54	59	29.90	29.94	E.	do.		Cloudy—cloudy.
	25	54	62	29.84	29.84	E.	do.		Drizzle—cloudy.
	26	54	58	29.84	29.85	E.	do.		Rain—rain in night.
	27	54	64	29.90	29.85	NW. W.	do.	1.40	Cloudy.
	28	56	78	29.85	29.85	E.	do.	.41	Clear—lightly cloudy.
	29	62	80	29.80	29.80	W.	do.		Lightly cloudy—clear.
☉	30	61	80	29.85	29.85	W.	do.		Clear day.
	Mean	58.63	71.50	29.87	29.87			6.56	

	Thermometer.	Barometer.
Maximum height during the month	89. on 18th.	30.05 on 10th, 13th. 16th.
Minimum do.	44. on 1st.	29.70 on 20th, & 21st.
Mean do.	65.07	29.87